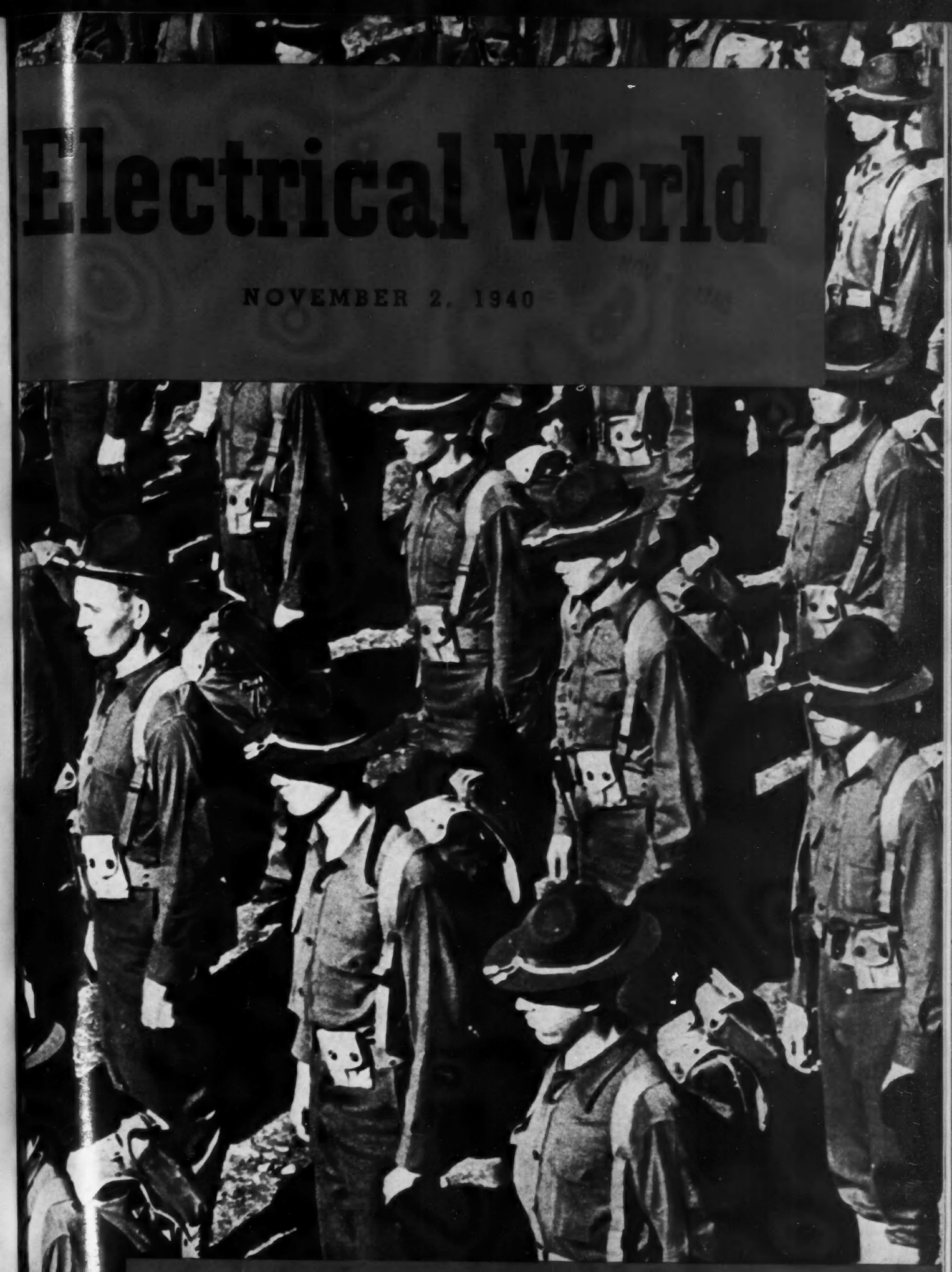
Electrical World

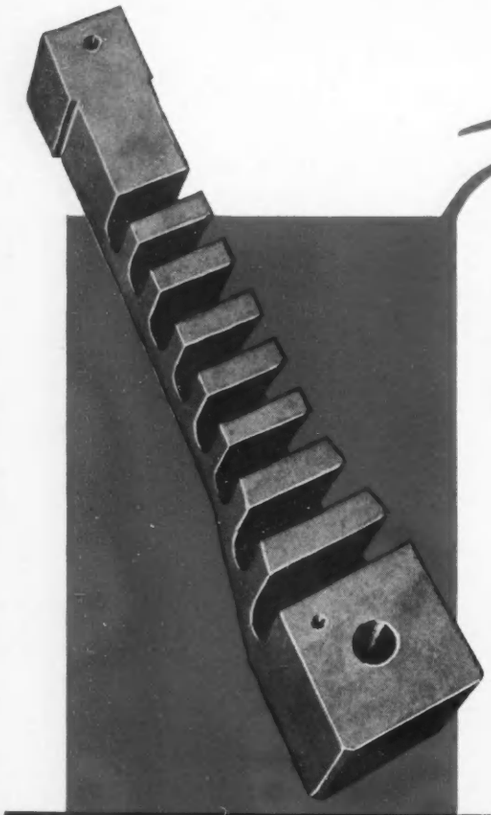
NOVEMBER 2, 1940

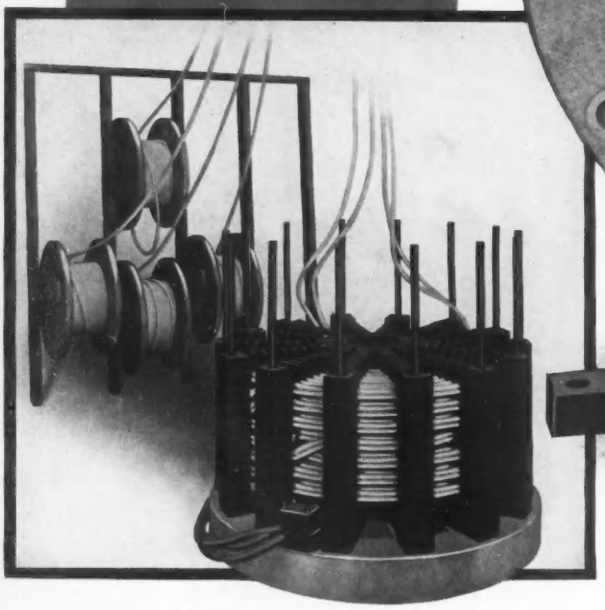


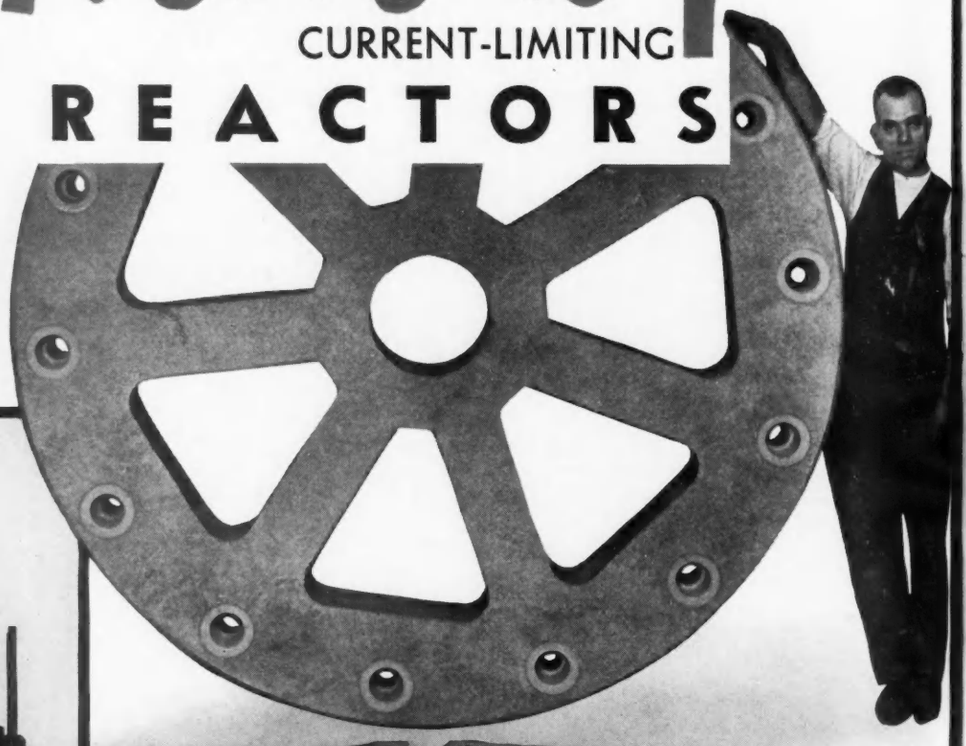
BUILDING AN ARMY—POWER SALESMEN SHARE IN THE JOB

OVERHEATING?

—no effect ON Murray CURRENT-LIMITING REACTORS







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November 2, 1940

Contents

Vol. 114, No. 18

Defense and the Power Salesman 53

Teamwork on Defense Power Supply 54
T. D. WEAVER, *Lieut.-Col., U. S. Army*

Forecasting Defense Power Needs 55
LELAND OLDS, *Chairman Federal Power Commission*

Military Procurement and Buying 59

Defense Power Consultant 62

Integrated Program Improves Station Reliability—II 42
J. A. KEETH and R. L. FRISBY, *Kansas City Power & Light Company*

Substation Oil Purified by Trailer-Truck Set 45

Primary Limits; Application of Feeder Voltage Regulators 46
R. O. LOOMIS, *Georgia Power Company*

Chicago Pioneers Permanent Fluorescent Floodlighting 49
E. D. TILLSON and CHARLES KOHLER, *Commonwealth Edison Company*

Tabulating Machine Records for Stores Control 51
K. C. CAMPBELL, *The Detroit Edison Company*

Process Heating Uses Oil for Heat Transfer 65
ROBERT M. HERMANN, *Montgomery Brothers*

Four-Year Record of Lighting Promotion 67
MERRILL E. SKINNER, *Buffalo Niagara & Eastern Power Corp.*

11-Circuit Structure Moved With Lines Hot 68
C. T. MALLOY, *Southern California Edison Company*

Carter Field on Washington Events 72

News of the Week 73

Editorials ..... 41 and 70
Field Operating Practices 84
Industrial Engineering 92
New Engineering Ideas 96
Load Building 102
New Equipment 104
Manufacturing and Markets 113
News About People 116
Recent Rate Changes 121
Rural Allotments 122
Sales Opportunities 123
Letters to the Editor 126
Index of Advertisements 132

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After the Battle

Within a few days the people of this country will have made their choice of the principles that shall guide the United States during the next four years and of the man who, as President, shall administer them. Whatever the vote, a large percentage of the people are naturally bound to be disappointed. Nevertheless, as a democratic nation we must all accept the selection of the majority and support it.

Our present problems, both foreign and internal, are so acute that we cannot afford at this time the luxury of diverse and opposed viewpoints on a great many questions. We must have national unity—unity of purpose and unity of action. It was unfortunate indeed that a presidential campaign with all of its belligerence and recrimination should have come at this period in world events. But as soon as the campaign is over, let us return promptly to the tasks of the nation and help the winner make the United States strong.

The immediate problem is national defense. Charges and counter-charges have been made, attempting to place the blame for this or that mistake. The time for criticism of what might or might not have been done ends with the election, after which the important thing is to prepare our national defense as quickly and as thoroughly as possible.

It was frequently stated during the heat of the campaign that if one of the candidates were elected private capital would come out of the strong boxes and that business would expand once more. This should happen no matter who is elected. The United States has a big bill to pay for defense, and the only way to pay it is through greater business activity and employment. Any defeatist attitude on the part of business is bound to bring the very thing that business fears the most.

One of the important things that will occupy the attention of the next administration, no matter who is elected, is our national economic situation. Irrespective of the political affiliations of our business executives, industry has a responsibility to help the government arrive at a constructive solution of this problem. If government is not helped by practical business men, we should not complain if the theorists take a hand at improving things.

And, finally, some time during the next four years we can expect the war in Europe and Asia to come to an end. The train of events that will follow in its wake will test the ability of American government and business to work together with foresight. Government will listen more respectfully at that time to business if in the meantime business has demonstrated its ability to work shoulder to shoulder with government in the present emergency.

Integrated Program Improves Station Reliability—II

***Special ventilation for bus and switch house relieve overloaded conditions and provide means of scavenging smoke in the event of fire — Adopt interconnected auxiliary power supply system for reliability** **

J. A. KEETH† and R. L. FRISBY‡ Kansas City Power & Light Company, Kansas City, Mo.

MODERNIZATION of the electrical protection of Kansas City Power & Light Company's twenty-one-year-old Northeast station in a program now approaching completion represents an attempt on the part of the company to enhance the reliability of an existing plant of moderate age, in which the concentration of power had exceeded the original design limits.

This program at Northeast station, in so far as the electrical system was concerned, has resulted in:

1. Steps to relieve the overloaded condition of the main 13.2-kw. station bus and reserve bus by special ventilation.
2. Rearrangement of the switchhouse layout and provision of ventilation for cooling and for scavenging of smoke and fumes in the event of fire.
3. Complete rearrangement of the 2,300- and 550-volt auxiliary systems to secure improved operating flexibility and availability.
4. Modernization of the 13.2-kv. main bus protection.
5. Rebuilding of all 13.2-kv. oil circuit breakers.

Points 4 and 5 will be made the subject of a subsequent article in ELECTRICAL WORLD.

Originally Ring Bus

Review of the original design of the station and an outline of the changes and additions that have been made up to the present is necessary to understanding of the program.

Original installation of the Northeast station was started in 1918 and consisted of three 25,000-kva. turbo-generators, connected to a dual switching-and-bus arrangement. The main bus was in three sections, connected in ring, with sectionalizing switches and 7.5 per cent reactors between sections. The reserve bus, though sectionalized with breakers, was not ring-connected nor equipped with bus reactors. In 1924 two 33,333-kva. units were added, bringing the station capacity up to 141,666 kva. An extension to the switch house at this time resulted in a five-section main ring bus and a five-section straight reserve bus.

Plant Enlarged

Distribution system was radial, consisting of 49 13.2-kv. feeder positions, all equipped with 0.75-ohm, 4 per cent, 400-amp. reactors and two oil circuit breakers per feeder, one to each of the two buses.

The 13.2-kv. bus and switch structures were concrete construction, with bare copper bar buses mounted on insulator supports in bus tubes or tunnels. Oil circuit breakers were of the live-tank type with sub-cell disconnects and concrete barriers separating phases.

Between 1923 and 1925 the first three generators were rebuilt to 27,500 kva., to correct a faulty design which resulted in excessive heating and failures in the stator windings. This increased the capacity of the plant to 149,166 kva. and at that time was considered the ultimate size of the station.

When installation of a 12,500-kva. high-pressure topping unit was started in 1929 to improve the economy of the station lack of space in the switch house made it necessary to tie this unit into No. 2 section of the bus. Further expansion of the high-pressure system occurred in 1938 with the addition of an 18,750-kva. topping turbine. Since the number of feeder positions in the station was adequate, the installation of this unit was made without an extension to the switch house. However, the sixth section of the ring bus with reactors and switching equipment had to be shoe-horned into the very limited space available.

June of this year saw unit No. 1, a 27,500-kva. turbo-generator, replaced with a 50,000-kva. unit, increasing the capacity of the station to 202,916 kva. The addition of more and more capacity to the station buses brought about a condition wherein currents higher than original designs contemplated were confronted. These resulted in thermal problems on buses, breakers and switches.

Ventilating Buses

Increasing the generator connected capacity on the bus by 80 per cent overloaded the original installation of two 4x¼-in. copper bars of the main bus and severely taxed the reserve bus, which was made up of two 3x¼-in. bars. Addition of one or even two additional bars would not give adequate current-carrying capacity for all operating conditions which could or would be encountered, nor would

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** See initial installment in "Electrical World," October 19, 1940, page 60.

† Manager power production. ‡ Electrical engineer of power stations.

it eliminate such weak points as disconnects, breaker terminals, bus joints and cable tie connections between sections where it was impracticable to reinforce, both from a physical as well as an economical standpoint.

Tests were made to determine what could be done by circulating air through the bus tubes, disconnect and switch terminal cells and also tie cable conduit. Tests showed that a load of 2,000 amp. on a bus consisting of two 3x¼-in. copper bars in a concrete bus tube 65 ft. long, 15 in. square would not cause a temperature rise in excess of 30 deg. C. when ventilated by ordinary 10-in. desk fan. Under the same conditions, except without the fan, the bus reached an actual temperature of 76 deg. C., or a 50 deg. C. rise in one hour, and was still rising at the rate of 6 deg. C. per hour when the test was discontinued.

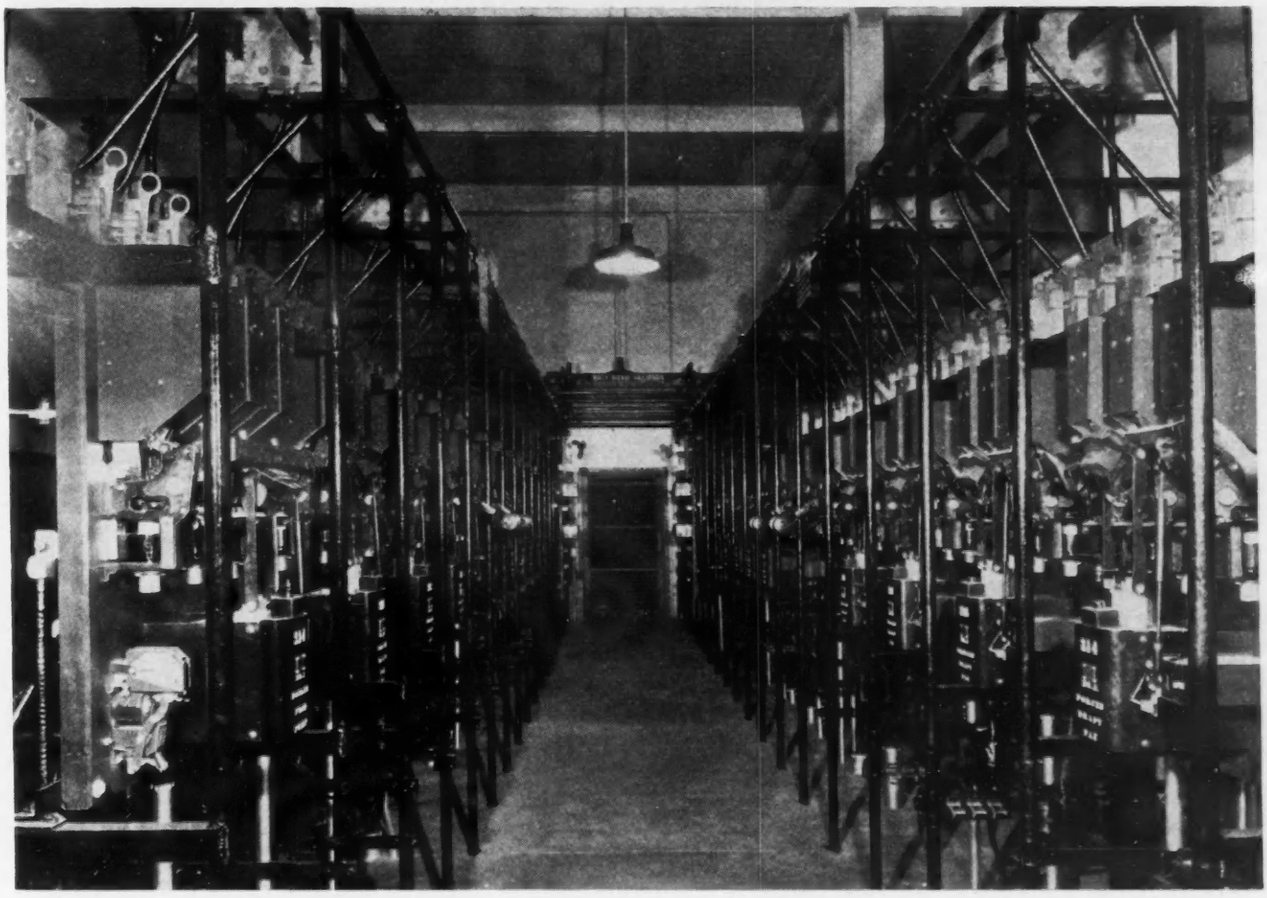
Although the study of bus ventilation and type of equipment to be used has not been completed, it has been carried far enough to assure that the desired results can be obtained at a cost many times below that which would be required to make any changes in the copper layout and bus structure.

Further to insure safe operation, all joints in the bus, switch and cable terminal lugs and disconnect contacts will be silver-plated, by using the brush-plating method. Plating can be done, in most cases, without disassembling the equipment. This, along with the use on all joints of heat-treated steel bolts having a tensile strength of 120,000 lb. per sq.in., practically removes the possibilities of overheated joints and connections.

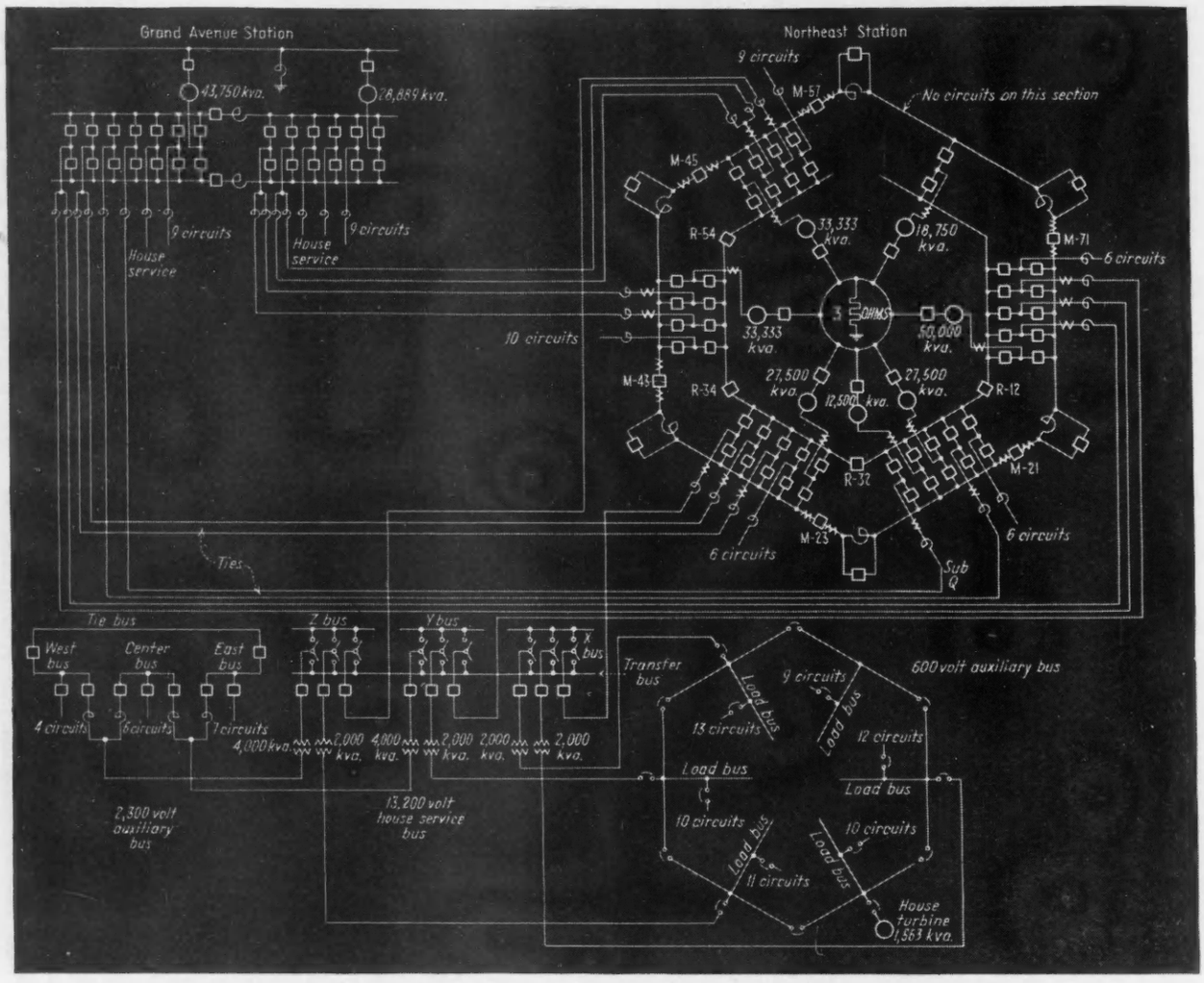
A severe rain and wind storm in August, 1938, was the indirect cause of a severe bus fault which led to the elimination of windows in the switch house, segregation of switch and reactor rooms and installation of a complete ventilating system for the switch house.

Windows in the switch house were of metal sash construction. Although closed and fastened at the time of the storm, the high wind deflected the sash and water was driven in through the openings. The water flowed over the floor into a circuit breaker cell structure of one of the outgoing tie lines, starting an arc to ground at a point between the circuit breaker terminals and the current transformers on the tie line. This constituted a bus fault. Exact location of the fault could not be determined at once and the voltage on the bus dropped to practically zero, resulting in the loss of station auxiliaries.

To prevent a recurrence of this trouble it was decided to brick up all window openings in the switch house. Closing all window openings made it necessary to install a ventilating system. This, however, was not the answer to the whole question. From the spread of fumes and smoke it was evident that segregation of switch and reactor rooms was necessary. This required a ventilating system for cooling purposes as well as for the removal of gas and smoke in



SEVENTY-NINE AIR-BREAK SWITCHES replace 99 oil circuit breakers on the 550-volt station auxiliary ring bus; air switches are mounted on pipe structures that supported oil breakers



MAIN AND STATION auxiliary bus arrangement adopted in Northwest station modernization program

cases of emergency. Fire walls of 6-in. hollow tile were erected, inclosing all stair wells; all doors were provided with panic lock bars and self closers. Filtered air for normal conditions is supplied under pressure to all bus rooms by a duct system, the fans being driven by a.c. motors connected to the normal station auxiliary power system.

Each room is provided with its own emergency exhaust fan, motor driven with energy from the station storage battery.

Auxiliary System

Louver dampers installed ahead of the fans are operated by air motors, with the air to the motors controlled by a solenoid-operated valve. The entire ventilating system is controlled from the operating gallery. The necessity for such a layout was clearly demonstrated at the time of the bus fault mentioned and its need was further indicated by similar troubles in other stations.

The original house auxiliary system was laid out on a unit basis. As the station expanded, changes and additions were made until the system became complicated, difficult to operate, had little or no flexibility and had no protection for segregating in case of faults.

Several schemes for improving it were studied, balancing the advantages and disadvantages relative to first cost, reliability, simplicity of operation and maintenance cost. Elements of the scheme selected are shown.

As shown, the 2,300-volt and the 550-volt auxiliary bus systems are interconnected through transformers to a 13.2-kv. three-section house service bus. These three 13.2-kv. sections have no ties between them and are each fed by a separate feeder from the main station bus, sections 1, 3 and 5. The loss of more than one feeder or more than one house service bus section is prevented in case of a fault on the main station buses. Feeder cables and bases of the 13.2-kv. house service layout are protected by differential relays.

Hazards Reduced

Six transformers are connected to the 13.2-kv. house service bus. Two 4,200-kva. units feed the three-section ring bus of the 2,300-volt auxiliary system. Load on this system is confined to auxiliary motors of the three high-pressure boilers, using a separate section of the ring bus for each boiler. Thus, loss of one transformer or a section of the bus will, therefore, disturb only one boiler. It is understood, of course, that both transformers will operate in parallel, connected to the bus. The ring bus is sectionalized with the breakers and complete differential relay protection.

[*Continued on page 66*]

Substation Oil Purified by Trailer-Truck Set

Portable outfit carries centrifuges, filters for oil and facilities for repairing, cleaning and repainting transformers, switches and circuit breakers

SUBSTATION MAINTENANCE, ordinarily a rather grimy task, becomes almost a white collar job through the use of a new maintenance unit built by the Arkansas Power & Light Company. Started as a rough chalk sketch on a concrete garage floor, and constructed step by step without the aid of blueprints, the unit embraces many new and valuable features aimed at maximum efficiency with minimum effort and greatly improved working conditions.

The unit consists of a Ford V-8 cab-over-engine truck with a 95-hp. motor and two-speed axle and a custom-built 21-ft. drop frame trailer with underslung springs. It was designed and the construction supervised personally by E. C. Stewart, system operator, and Sloan Cummins, superintendent of transportation, of the Arkansas Power & Light Company. The trailer body was constructed in the plant of the Standard Steel Products Company, in Pine Bluff.

The unit is utilized to purify oil in transformers, switches, circuit breakers and other substation equipment, as well as to clean and paint them.

The tractor truck has a 101-in. wheelbase and a two-speed rear axle was included in order that gasoline mileage could be increased when the power unit was not towing the trailer, or when it was towing it on smooth, level highways.

Built Around Equipment

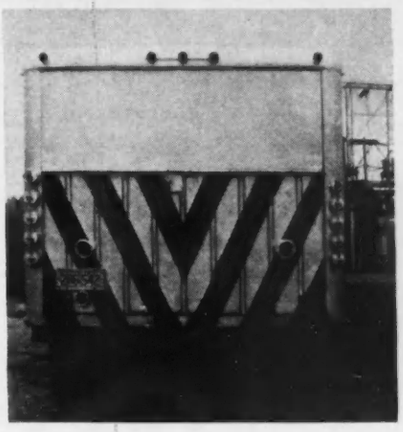
Contrary to the usual procedure, the trailer was built to fit the equipment it contains. The principal equipment is a No. 84-36P DeLaval transformer oil purifier, with a 12-in., 20-section filter press. This equipment is located in the center of the dropped section of the trailer, with 2 ft. of working space in front and behind and on each side.

Built into the sides are racks of five pipes each, arranged one pipe above the other at a slant, with the rear ends higher. Each pipe contains one 10-ft. section of oil-resistant flexible hose with union couplings on each end. Halves of unions fitted with small handles screw into the connections on each end of the hose sections to protect the threads.

Five of the hose sections are 1¼ in. in diameter and, when coupled together, form the 50-ft. intake hose that transmits dirty oil to the purifying equipment. The other sections are 1 in. in diameter and form the discharge hose that leads from the purifying equipment back to the transformer or switch.

At the lower end of the slanting

[*Continued on page 48*]

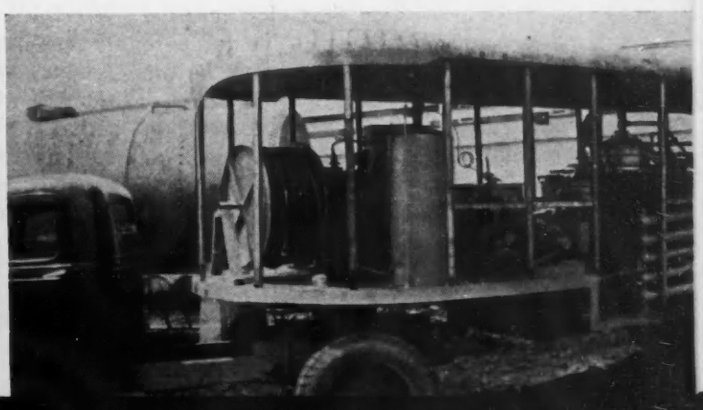


REAR DOORS are steps, marquee and traffic warning

Above—Lower half has steps for entrance. The five objects at each side are screw covers for the oil-hose pipe carriers. The covers are padlocked by rod passing through eyes in the handles. Below—When closed the stripes offer traffic protection. Marker, direction and tail-lights are provided.

TRAILER houses oil purification and other substation maintenance equipment

Fan and louvers at front provide ventilation to supplement windows at side. Tractor carries two-man maintenance crew with their luggage. Construction-stage view shows oil-purifying in center, drained pipes for carrying sections of oil hose. Up front are a power-cable reel (with porthole in floor at right), junction box, workbench, tool chest and air compressor.



Primary Limits; Application of Feeder Voltage Regulators

Distribution improvement aims at service satisfactory to customer — Calls for compromise between idealism and practicality — Induction regulator counteracts bus regulation, truck feeders and part of branch, transformer, secondary voltage drops

R. O. LOOMIS, Distribution Engineer, Georgia Power Company

ABSOLUTELY perfect electrical distribution would require absolutely (1) constant frequency, (2) constant voltage, and (3) uninterrupted service. But perfection in these three quantities, as with anything else, cannot be obtained at any cost, reasonable or otherwise. So, budgeting and execution of distribution are a matter of compromise between idealism and the practicality of rendering service satisfying the customer while attaining the benefit of the improvements at most economical outlay. It does not pay to save $1 per kva. in feeder capacity and spend $2 more for transformer capacity or some other item. Nothing can be done about correcting frequency on the distribution system, and it is, therefore, a problem of establishing and regulating voltage and providing for continuity of service.

Probably the degree of service perfection desirable is what the average customer considers satisfactory. In the absence of other confirmatory information and looking at it from the company's viewpoint, service deserves being rated as satisfactory if it is such that the customer continues to increase his use of energy at a rate which covers the whole cost of rendering service.

Limiting Voltage Variation

As for voltage constancy, it is believed that for areas outside the dense commercial districts voltage at the customer's service entrance is satisfactory if maintained between the limits of 112 and 120 volts on systems normally 115 volts. Flicker is a factor, but it is a matter primarily

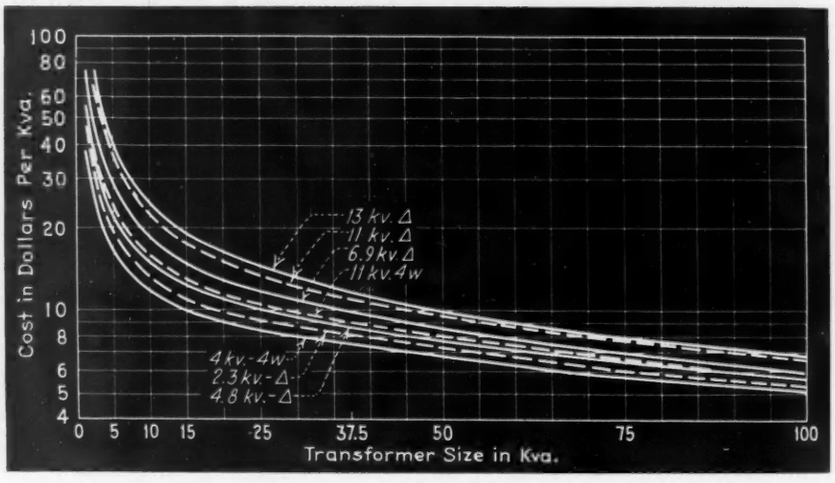


FIG. 1—COST of single-phase transformer capacity installed

of transformers, secondaries and services rather than of the primary feeders and regulators considered here.

In a well-designed distribution system the voltage drops would probably divide into three approximately equal 3 per cent parts for (1) primary, (2) transformer and (3) secondary. Inasmuch as the resulting 9 per cent (at full load) is outside the range cited above, reliance is placed on some form of feeder voltage regulator to overcome as much as 5 or 6 per cent of the total drop by overcompensation at the load center. That means that the primary is arbitrarily designed to have not more than 3 per cent voltage drop beyond the load center. This 3 per cent becomes at once one limitation to the size and extent of each primary circuit.

A second limitation to the size and extent of primary circuit arises from a consideration of the hazards to service continuity and of such data as are available for quantitative analyses of customer-minutes of interruptions per year. Records of varying degree are readily obtainable on the frequency and duration of interruption to large customers, substations and entire feeders, but much more difficult to obtain or even estimate for residential and commercial customers, collectively or individually. A record of total time lost by clocks on synchronous time switches on off-peak loads might appear to offer an index. However, a comparison of the number and durations of 4-kv. feeder breaker outages with the loads, circuit area, circuit length and load density failed to disclose any correlations.

Admittedly, the ignored factor in such analyses is the element of maintenance and relative physical condition of the circuit. In fact, this is often the predominant factor. Con-

sequently, before investing money in additional feeders and feeder breakers to improve service continuity it is profitable to make sure that even more improvement cannot be effected by intensified maintenance measures on such items as tree conflicts, bad poles, slack wires and transformer installations that result in excessive blown fuses.

Another way of contributing to service continuity is to set somewhat arbitrary limits to the primary circuit extent. It certainly appears plausible to accept the probability that twice the exposure (in circuit feet) or twice the number of customers on the circuit would result in twice as many interruptions per customer.

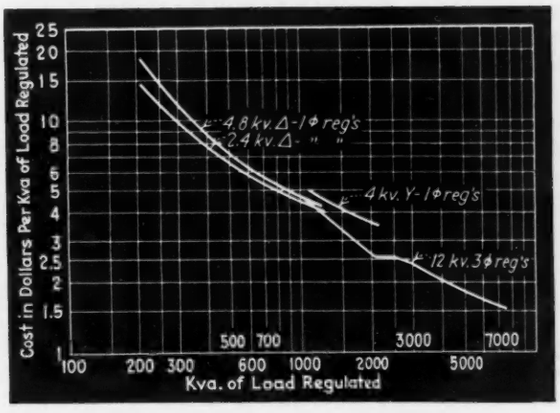


FIG. 2—COST of regulators for three-phase service

Economy is afforded by regulating the load in large blocks rather than in small blocks. Economy is also afforded by higher distribution voltages where the voltage drop in feeders is low enough to permit the use of bus regulation.

This reasoning would warrant limiting the total feet of line on any one circuit as well as the load. Again, however, company records do not indicate any greater number of *breaker operations* (not customer interruptions) on long circuits than on short ones. This is probably because a short-circuit occurring more than about 2 miles from the station end of a 4-kv. feeder will not result in sufficient current to trip the feeder breaker. However, judicious use of sectionalizing equipment will almost entirely do away with the necessity of limiting the exposure on a circuit.

Since about 2,000 kva. can be carried by 300-amp. regulators and No. 4/0 copper at 4 kv., this figure is used as the maximum load on any one 4-kv. circuit. When 8 and 12 kv. are more extensively employed this value may well be increased.

Thus the conclusion is reached to set the following design limitations for 4-kv. circuits.

1. Three per cent voltage drop beyond load center.
2. Not over 2,000 kva. load.
3. Not over, say, 100,000 ft. of circuit exposure.

Distribution Revision

From the known rate of load growth an appropriate decision must be made as to the percentage capacity to which feeders are to be loaded at the start. These criteria also apply as a test of the propriety and probable economic efficacy of existing feeders.

Before setting out to plan revisions for distribution systems the following requisites should be in hand:

1. An accurate map of the system.
2. Maximum demands during the preceding year and an estimate of load growth expected during the next few years.
3. Voltage charts showing the voltage drops in the primary feeders and branch lines, and maximum demand readings showing what load was being carried at the time that the greatest voltage drops occurred.
4. A series of bus voltage charts.
5. If possible, an estimate of locations in which the greatest load growth will probably occur.

Alternative Solutions

If the problem is either (1) to carry more load or (2) to improve voltage regulation, the solution is usually one or more of the following procedures:

1. Increase the voltage of the system.
2. Increase size of copper.
3. Install additional feeders.
4. Change branch lines from single to three phase.
5. Transfer large loads from the distribution circuit to one of higher voltage if it is available.
6. Install boosters on long branch lines.

Change from 2.3 to 4 kv. is usually easily justified wherever the load on a substation exceeds about 800 kva. and not much 2,300-volt equipment is in use. As load density increases it becomes more economical to use higher voltages; when the average size distribution transformer exceeds 25 kva. consideration may be given to 8 or 12 kv. As transformer sizes increase the difference in cost per kva. of capacity between high and low voltage ratings becomes less (see Fig. 1). When the average size is 100 kva. the cost per kva. is only $2 more at 13 kv. than at 2.3 kv. Since feeder capacity costs from $6 to $10 per kva. more at 2.3 kv. than at 11 or 13 kv. most underground systems in commercial areas are more economical at the higher voltage.

Therefore when a higher distribution voltage, such as 11 or 13 kv., is already available in a city, and particularly when the 4-kv. system is supplied from the higher voltage system, it is usually economical to supply all loads having a maximum demand of 100 kva. or more directly from the higher voltage. When 2.3- or 4-kv. feeders or substations on such a system are loaded, it is well to investigate the possibility of unloading them by changing a few large loads from the lower to the higher distribution voltage.

Feeder Voltage Regulators

When laying out new feeder areas or improving old ones many of the areas receiving low voltage may be improved sufficiently by changing to three phase rather than replacing copper or changing location of load center. Where a circuit serves an area on the edge of town and there are one or more very long branch lines, we disregard these in locating load centers and care for excessive voltage drop in them independently with voltage boosters.

Examples of the execution of these conclusions will be the subject of subsequent articles in the series.

Induction regulators of 2,400 and 4,800 volts vary in cost from $3 to $15 per kva. of the load they are capable of carrying with 10 per cent buck or boost (Fig. 2). They cost half as much per kva. of load carried when connected for 5 per cent buck or boost. Three-phase step-voltage regulators in the larger sizes and higher voltages cost as little as $1.50 per kva. of load carried with

10 per cent buck or boost. This accounts for some of the possible economies of higher distribution voltages where the voltage drop in feeders is low enough to permit the use of bus regulation. It may also be seen that savings are made by regulating the load in large blocks rather than small ones.

Voltage regulators are used to counteract voltage drops of the three following classes:

1. Bus regulation.
2. Part of the voltage drop in primary branches, transformers and secondaries.
3. Voltage drop in trunk feeders.

All regulators perform the first two functions, while those on definite load center type feeders must also perform the third function. Therefore, even if regulators are installed primarily because of bus regulation, voltage charts should be made on the distribution system to ascertain how much over-compensation is desirable.

All radial distribution circuits are tree type beyond a point from which the voltage drop is not more than the desired figure, referred to before as 3 per cent. If this point is not at the substation, a trunk feeder is necessary from the substation to this point. The length of this trunk feeder is limited by the allowable voltage drop in it, and since this is dependent on the voltage, the maximum area served by any one substation depends largely upon the distribution voltage.

Calculating Regulator Rating

In calculating the required regulator capacity all calculations should be based on what conditions will be when the circuit is loaded. All voltages are in actual volts, referred to 115. One of the limits at peak load on the circuit is the maximum voltage which the customer served from a transformer at the load center can tolerate. We have already set this limit at 120 volts. Since this transformer might have only 1 volt drop, the maximum primary voltage at the load center will be about 121 volts, so the full load voltage at the load center should be 6 volts higher than at no load. Assume the feeder to be such that the voltage drop is 8 volts, referred to 115. Therefore, the voltage at the substation end of the feeder at full load must be 115+6+8=129 volts. The duty of the regulators is to vary the voltage on the substation end of the feeder from 115 to 120, depending on the load.

The substation bus voltage should never be less than 117 volts, which is the minimum which the regulators can boost to 129, nor more than 126 volts, which is the maximum the regulators can buck down to 115. The taps in the substation transformers should be set to keep the voltage within these limits. The difference between 117 and 126 volts, or 9 volts, is the maximum permissible bus voltage variation. If the substation bus voltage is actually within this limit, regulators connected for 10 per cent buck or boost will be satisfactory. It will be seen that when the bus regulation is small, longer feeders may be used with 10 per cent regulators.

Assume the same area as above but with the substation at the load center. The regulators would then have to maintain a voltage at their terminals of 115 to 121, depending on the load. If the bus voltage can be adjusted to give not less than 115 volts nor more than 121 volts, regulators connected for 5 per cent would be adequate.

Due to transformer charging current and various loads, no-load conditions on a feeder are never reached, so that the voltage at the load center will never drop much below 117 volts. This affords a few volts leeway to allow for unforeseen conditions.

Boost or Buck Transformers

In the case mentioned above, if we had both 5 per cent and 10 per cent regulators in the same station, the bus voltage could not vary more than from 117 to 121 volts and still give satisfactory service. If the voltage does vary more than this it is possible to install permanent boosters on the long feeders, or permanent bucking transformers on the short feeders. This will cost considerably less than to install 10 per cent regulators on all the feeders.

In some cases all the circuits out of a substation are tree type, but loads have reached a point where the drop in the lines is considerably more than the desired 3 per cent limit. In many cases it may be found cheaper to bring the regulation in the lines down to our 3 per cent limit than to install trunk feeders, particularly where this may be accomplished by changing a 2,300-volt distribution system to 4 kv.

Substation Oil Purified by Trailer-Truck Set

[*Continued from page 45*]

pipe containers are nipples that are piped though the floor to carry off any surplus oil that drains out of the hoses after they have been used. This draining after each operation assures a clean hose for the next job.

The DeLaval centrifugal purifier and filter press are mounted firmly on the floor of the dropped section of the trailer. Intake and discharge pipes run down through the floor and are teed beneath, making connections easily accessible from either side.

Two 1,400-gal.-per-hour gear-type pumps, both operated by the same 3-hp. motor, draw the oil to be cleaned out of its equipment and pump the cleaned oil back after it has gone through the purifier.

From the intake pump the oil passes first through a 6-kw. oil heater which raises the temperature to 90 deg. It is then directed into either the purifying centrifuge, or the filter press, or both. From the centrifuge, the cleaned oil passes into a deaerating tank, from which it is then pumped back into the equipment, or through the filter press.

The centrifuge bowl, which whirls at a rate of 6,500 r.p.m. and requires five minutes to get to full speed, is driven by a 5-hp. motor. The separating element, which weighs 350 lb., is lifted from its carrier into place by a screw-driven crane that is part of the purifying machine itself. But a special crane was rigged up by the designers to hold the metal cover for the bowl when it was not in use. This consists of plain pipe, elbowed and fitted with a pulley and rope.

Leveling the Machine

Because of the high speed at which the bowl revolves, it is absolutely necessary that a perfect level be attained for the machine. To assure this, spirit levels were affixed to the base of the machine by the trailer designers. The machine was leveled first, and then the levels fastened to

[*Continued on page 127*]

Chicago Pioneers Permanent Fluorescent Floodlighting

New fluorescent technique offers a method of floodlighting buildings without setbacks for projector banks — Ingenious design overcomes problems of low operating temperature, mounting, maintenance and supply

E. D. TILLSON and CHARLES KOHLER,† Commonwealth Edison Company, Chicago*

BUILDING FACADES that rise sheer from sidewalk to roof without setbacks or other hiding places for projectors have long puzzled engineers and architects bent on decorative floodlighting. Commercial buildings have offered the chief problems. They have been floodlighted, in some cases, by creating special canopies or balconies for the projectors, but, in general, this solution is ruled out because of the expense and complication involved.

A new and significant approach to the problem has been the use of fluorescent lamps to floodlight the east face of Commonwealth Edison Company's Northern Service Building tower. Three sides of this tower, north, south and west, could be and were floodlighted by incandescent equipment mounted on adjacent roof areas. Fifteen 500-watt floodlights with asymmetric lenses were banked on each of these sides. But because the east face of the tower, which is the front of the building, rises sheer from the ground to a height of 103 ft., there was no logical means of floodlighting it from banks. Accordingly, fluorescent floodlighting was considered.

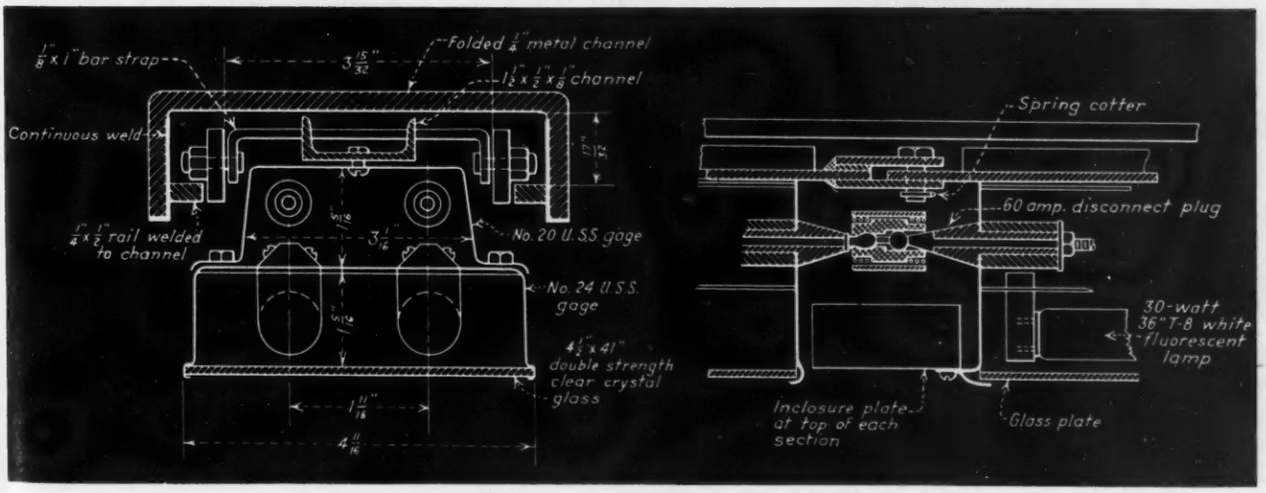
Troughs Employed

With this decision several problems presented themselves: (1) How were the lamps to be mounted and supported, and what color lamps were to be used; (2) what facilities were to be provided for maintenance and relamping; (3) how was dust and dirt to be excluded from the troughs; (4) in zero weather how could the proper operating temperature for the lamps be maintained, and (5) in what manner were the lamps and auxiliaries to be connected electrically?

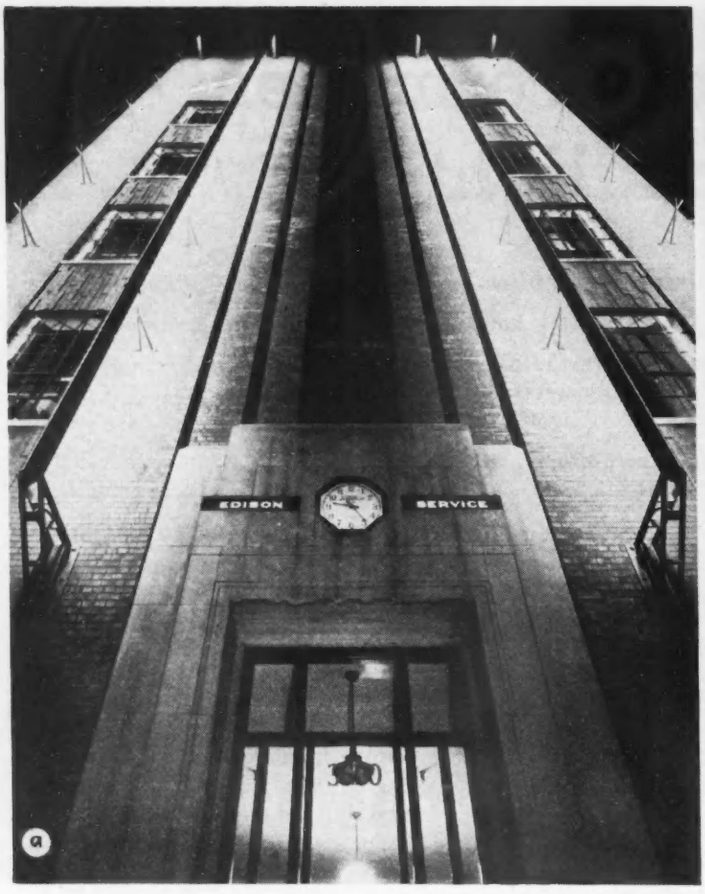
In the final installation four long, trough-like fixtures, each housing 40 white 30-watt fluorescent lamps, were extended up the face of the building from a point 16 ft. from the ground, and positioned along the center lines of the four brick pilasters on the facade of the building. Standing out 3 ft. from the lighted surface and directed toward it, the assemblies flood their respective panels with an intensity of light comparable with that from the banked floodlights. Density, however, is only 0.84 watt per sq.ft., compared with 3.1 watts per sq.ft. for incandescent. White lamps were selected for use in the troughs because their luminosity is very high and there is just sufficient red in the light output to create an attractive response from the red brick, which has hitherto been considered a rather difficult surface to light.

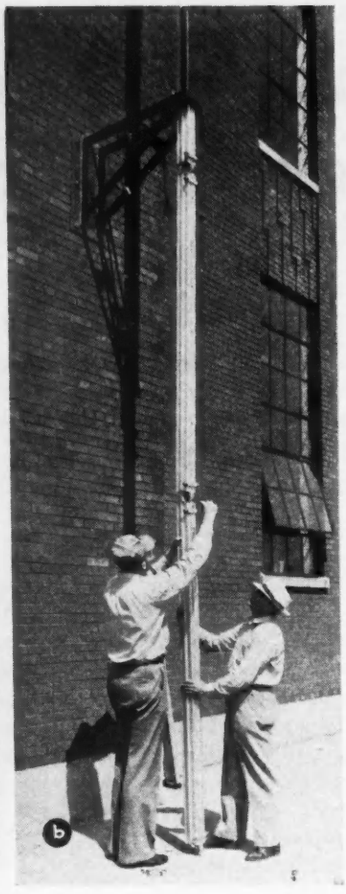
Each of the four fixtures is 72 ft. long and is made up of ten metal

* Testing department. † Engineering department.


1/8 x 1" bar strap
Folded 1/4" metal channel
1 1/2 x 1/2 x 1/8 channel
Continuous weld
1/4 x 1/2 rail welded to channel
No. 20 U.S.S. gage
No. 24 U.S.S. gage
4 1/2 x 41" double strength clear crystal glass
Spring cotter
60 amp. disconnect plug
30-watt 36" T-8 white fluorescent lamp
Inclosure plate at top of each section
Glass plate

TROUGH SECTIONS are arranged to run up and down aligning structure on rails welded to 6-in. channel (left). Simple, mechanical coupling and disconnect plug join trough sections mechanically and electrically (right).





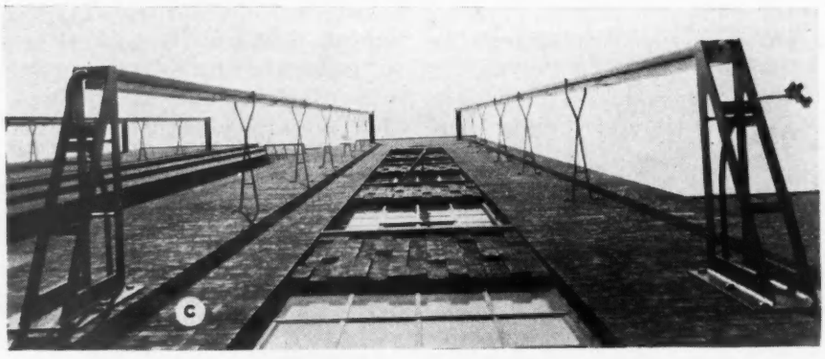
FLUORESCENT LIGHT a new tool for architectural floodlighting

(a) Commonwealth Edison's Northern Service building lighted by 160 30-watt white fluorescent lamps, wattage density 0.84 watt per sq.ft.

(b) Workmen connect one of the trough sections. There are ten 7-ft. trough sections in each housing, each trough containing four lamps. Troughs are supported by cable controlled by a winch inside the building.

(c) Looking up the building face from below, the method of supporting trough assemblies and electrical cable connections are visible.

trough sections coupled end to end and arranged to slide up and down in a track integral with a fixed outer steel raceway, formed from a 6-in. folded metal channel, which serves to align and rigidly support them. The ten trough sections are suspended in this raceway from a $\frac{3}{8}$-in. phosphor bronze cable attached to the uppermost trough section, and which passes up over a sheave and through the wall of the building to a winch by means of which the entire assembly of trough sections can be lowered to the ground for maintenance and relamping. On lowering the assembly, as each section clears the lower end of the raceway it may be uncoupled from the others and laid on supports for relamping.



Two Compartments

Individual trough sections are 3 in. thick, 5 in. wide and 7 ft. long and consist of two compartments. The larger section contains four 30-watt lamps in parallel lines of two lamps end to end, and also a 10-watt heater, of which more will be said later. The face of the large compartment toward the building is closed by a plate of double strength clear crystal glass. The smaller of the two compartments houses the lamp auxiliaries and wiring and is attached to the back of the larger compartment, as shown in the sketches.

The glass plate that incloses the face of each trough section serves the double purpose of (1) excluding moisture and dirt and (2) helping to maintain a satisfactory "starting" temperature around the lamps in winter months. It is well known that fluorescent lamps will not start satisfactorily at temperatures in the vicinity of 32 deg. and below. Since the temperature outside the service building not infrequently reaches zero, and below, in winter months some means had to be found for increasing the ambient temperature in the trough. The inclosing glass plate and the installation of a 10-watt tubular resistor at the lower end of each trough section is expected to serve this purpose.

Each of the four trough assemblies is fed separately from a cable that attaches to terminals on the lowest trough section. Electrical connections from section to section are through contact pins in the ends of each trough, as shown in the accompanying sketches, which also show the method of coupling the trough sections and their relation to the raceway.

This installation is the result of a joint study made by the testing and engineering departments of Commonwealth Edison Company and the architects of the building.

Tabulating Machine Records for Stores Control

Mechanical equipment prepares information in form that permits intimate and quick control of materials and supplies — Details of accounting operation — Expedites inventory data

K. C. CAMPBELL, General Storekeeper, The Detroit Edison Company

IT IS ONE THING to prepare stores accounting figures and another thing to interpret and use the facts disclosed by them. If the preparation of the figures is arduous and expensive, it is quite probable that there is so much time spent in their preparation that the records are not quickly available for study and for the other uses for which they were prepared. In other words, experience of long standing has established that about so much time and money can be spent on record keeping, and while the records so obtained may leave something to be desired, they are accepted as the best that can be afforded.

Methods and Benefits

The control of materials and supplies, called "stock control" for short, is a common and often misunderstood term. It means literally what the words say, but it is often used in terms of money investment only, whereas in this article it is used in its broadest application to money, materials, service, purchasing, warehousing, handling, transporting, etc. While the main theme in this article is the use of mechanical accounting equipment, it is necessary to bring out just what we do with it in the line of stock control and what benefits we are getting from it. You will then see why we were insistent in going to great lengths to provide our men with the proper information.

Foremost in our stock control work is the absolute stipulation that service to other departments must be maintained at a high standard and all steps taken must be consistent with this. The following matters are directly related to stock control in some degree:

1. Investment in stock.
2. Purchasing routine and prices.
3. Turnover of stock.
4. Scheduling of incoming materials to meet needs.
5. Storage space in warehouses.
6. Handling of materials.
7. Transportation of materials.
8. Obsolescence and spoilage.

In the preparation of stock records for the purpose of controlling the investment, time is an important factor, but I believe that too much emphasis has always been placed on keeping stock records posted up to date within 24 hours, 48 hours or some such loose margin of time. This point has been quoted against the use of tabulating equipment, the claim being made that anywhere from four days to a week might elapse from the time of the transaction to the receipt of the information.

Admitting that there is some little delay, what of it? In a stock account which has a turnover period ranging from two months to four months, why should any one get excited about waiting a week for reports, especially if the reports prepared during that time obviate the tiresome work of preparation under a hand-posted or partly mechanized system? The worst that can happen is occasional delay in reordering stocks depleted during the time that reports are in preparation. A little application of ordinary good storekeeping will produce the necessary solution.

Conventional stock records fail to measure up to the demands in many ways, especially in large utilities when the same items are carried in several warehouses. In this case it is necessary to know all about the items in the aggregate as well as in each warehouse.

Let us consider what we might expect to get out of the conventional records. The essential things are records of "Receipts and Disbursements" and "Balances on Hand." In some cases prices and values are also carried, but these latter elements are not essential for the control of stores. Some guide as to the proper amounts to keep on hand and the time of ordering is usually necessary. This is variously expressed as "Maximum and Minimum" limits, "Ordering Point," "Normal Stock" or some other suitable designation. The function of the records is to picture the condition of the various stock items and thus assist in providing and controlling the materials and to furnish figures against which periodical inventories may be checked and reconciled with the general books.

Past Practice

In the utility whose system is described in this article the staff of the stores department made a careful survey and, with the co-operation of other departments concerned, decided upon some radical changes in procedure. From 1926 to 1938 this company had a partly mechanized stores record system. To describe it briefly, the warehouses had hand-

posted records of quantities only and the accounting department had a fully mechanized record system of aggregate quantities and values. Tabulating tapes showing stock numbers, quantities and references were sent back to the warehouse for the purpose of checking their postings. No records were kept in the central stores department office, all information being furnished from the warehouse records supplemented by occasional references to the accounting department records. It was difficult to do a good job of stock control, especially on items which were carried in several warehouses.

Mechanize Compilation

In 1938 it was determined to make certain changes which would result in a fully mechanized system with more essential information to be supplied to those in charge of control work. The first step was to discard the hand-posted records in the warehouses, substituting for them a tabulating tape known as the weekly stock control tape. This tape shows the following information on items which moved during the current week:

1. Date of last activity.
2. Stock number.
3. Abbreviated description (limited to twenty-one spaces).
4. Unit.
5. Location.
*6. Kind of material.
7. Normal stock figure.
8. Balance on hand.
9. Week's receipts.
10. Week's issues.
11. Accumulated issues this quarter.

*Kind of material—Code numbers are used to designate the seven classes into which stock is divided for analytical purposes, viz.: General Stock, Construction, Spare Parts, Maintenance, Experimental, Salvage and Surplus.

All papers concerned with accessions and withdrawals of stock, such as receiving reports, requisitions, sales, transfers, etc., are mailed daily by storekeepers to the tabulating bureau. These records are immediately punched into tabulating cards so that at prearranged times or at any special times tapes may be prepared showing the status of the warehouse stocks. The above tape is compiled following the close of business each Wednesday and is ready for the storekeeper's use on the following Monday. The information necessary to replenish stock is obtained by a comparison of "Balance on Hand" with the "Normal Stock Figure," supplemented, as in the case of all types of stock records, by information on special requirements. The other information contained in this tape is obviously useful in detecting slow-moving items, to observe turnover, and for other purposes.

The second step was the rather radical one of putting into the hands of the division storekeepers the responsibility for a good share of the ordering of materials from the purchasing department. This was formerly done in the stores department main office. Such ordering is confined to standard materials only, all special materials being routed through the main stores department office. A great deal of the material thus ordered is on contract and simply has to be released for delivery when wanted.

Two additional tabulating reports were provided for this second step and other purposes

1. Monthly stock list tape.

This provides each month, on all items whether they move or not, the same information as shown on the weekly stock control tape except for weekly receipts and weekly issues. This tape is useful on account of the balance and activity of all items being made available for study and reference.

2. Quarterly stock control tape.

This report lists every quarter all items at each location whether they moved or not. This report differs from the preceding one in that the money value of issues and balances are shown. In the months this tape is issued the monthly stock list tape is omitted. The quarterly stock control tape gives the following data:

1. Date of last activity.
2. Stock number.
3. Abbreviated description (limited to twenty-one spaces).
4. Unit.
5. Location.
6. Kind of material.
7. Normal stock figure.
8. Issues—quantity and value of each item.
9. Balances—quantity and value of each item.

These data are regularly used in an individual check of each stock item for turnover, possible obsolescence, change of classification, etc. The values shown on this tape are the basis of periodical reports and special studies made for stock control purposes.

Special Reports Available

As an example of what can be done by the compilation of special reports consider the case of overhead lines material consisting of approximately 500 items which are carried at seventeen out of twenty-seven of our warehouses and on which a regular monthly report is made. A knowledge of what each warehouse carries is particularly essential in order to equalize and utilize the various stocks. This is a monthly tape and contains the following information:

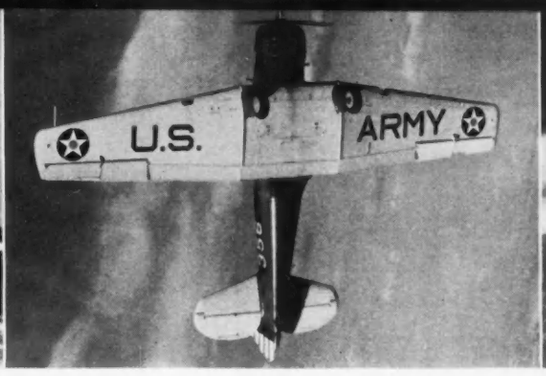
1. Date of last activity.
2. Stock number.
3. Abbreviated description (Limited to twenty-one spaces).
4. Unit.
5. Locations—The data for each location for each item are listed.
6. Kind of material.
7. Normal stock.
8. Balance on hand.
9. Accumulated issues for quarter.

[*Continued on page 124*]

QUARTERLY STOCK CONTROL TAPE

DATE OF LAST ACTIVITY	STOCK NUMBER	DESCRIPTION	UNIT	LOC.	KIND *	NORMAL	QUANTITY ISSUES	VALUE OF ISSUES *	QUANTITY BALANCE	VALUE BALANCE *
3 40	227 0021	FLARE LINEMAN N03020	EA	43	2	10	18	30.6	10	17
								30.6 *		17 *
3 40	230 0050	ROD BRAZE 1/8X36PHOSC	LB	43	2	10	25	337.5	14.5	195.8
								337.5 *		195.8 *
2 40	231 0002	SHOE CLAMP 231/1DETI	EA	43	2	6			12	30.1
3 40	231 0006	CLAMP CONDIT3/4NP1HOL	EA	43	2	25	50	10	45	9
3 40	231 0007	CLAMP CONDIT1NP 1HOLE	EA	43	2	25	15	3.9	23	6
2 40	231 0008	CLAMP CONDIT1 1/4NP1H	EA	43	2	10	3	1.9	13	8.1

TYPICAL RECORD as furnished to stores department by tabulating bureau.



Defense and the Power Salesman

Adequate preparation for defense of this nation can be accomplished only by teamwork. By using the lash of dictatorship Hitler and Mussolini have driven the peoples of their countries into teamwork. It is our task in the United States to prove that teamwork derived from voluntary co-operation, from willingness to serve and to forego, will produce greater and better results than the teamwork of compulsion. If we fail to prove this, then the privileges we have so long enjoyed of self-government by free men will be taken from us.

Teamwork is not limited to those supplying war materials. It includes all who have any part in fashioning the machinery and implements of defense, from the finished product back to the last item of raw materials. Without teamwork, without co-ordination, we will waste the most essential element of our defense program—time.

Of all the raw materials that enter into the preparation for national defense none perhaps is more universal or important than electric power. Not only is it important in its continuity and sufficiency, but also in its manners and methods of application.

Industry's consultant, the power salesman, though his deeds may be unsung, will be one of the more important members in the team that implements national defense. His customers—the thousands of factories which will make some part of the defense machine—can and will use his help in getting adequate power supply, in making new uses of electricity to improve and speed up production.

But these are the power salesman's normal job. Defense has imposed an added responsibility—that of balancing industrial production of defense material in such a way as to utilize available labor and power capacity. If all of the defense production were dumped in a few localities chaos would result.

To help the power salesman pull his weight in this defense team we have brought together this series of informative articles on defense programming.

Greatest production in shortest time is the demand on American industry. The power salesman can help industry to meet this demand by emphasizing the resources of utility service, by means of which the productive hours use of manufacturing facilities can readily be increased. He can help by showing how electricity may be employed most efficiently in industrial tasks. To do this he must keep himself informed of latest methods and equipments for electricity application and he must be untiring in his efforts to convince the industrial plant operator of the values of these developments.

Industry's power consultant has a bigger job today than he has ever had. In his hands to a large degree is the administration of industry's No. 1 raw material. The Army, the Navy and industry are asking for his help.

We hope these pages may be useful to him.

Pictures on this page and succeeding eleven pages are from official photographs furnished to Electrical World by the Army and Navy.

Teamwork on Defense Power Supply

Studies of power availability and adequacy made by army gathered much valuable information which now must be supplemented and put to work by the joint effort of utilities, government and military

Lieut.-Col. T. D. WEAVER, Corps of Engineers, U. S. Army

THE SURVEY of the existing and potential industrial demands for electric power which is to be conducted by the Federal Power Commission presents an opportunity for joint beneficial action which should be welcomed by the users of power, the electric utility industry and all agencies of the federal government which are concerned in power problems.

In this day of modern warfare, when the supply of munitions assumes an ever-increasing importance, it is essential that the nation's manufacturing industries be assured of an adequate, dependable supply of the electric power required to produce the countless articles, large or small, complex or simple, which the army of today and tomorrow must have. Power must be available when and where needed. The War Department is, therefore, especially interested in the results of this survey, since it is one of the two departments of the government primarily responsible for the defense of our country.

Plans for Power

The National Defense Act specifically charges the Assistant Secretary of War, under the Secretary of War, with the duty of providing the munitions of war. Under this authority the office of the Assistant Secretary of War has for many years made studies and devised plans for obtaining the necessary supplies and contributory materials. Power, together with fuel and transportation, was naturally included in these studies and plans.

Since 1921 the Corps of Engineers has conducted an annual electric power survey, in which the utility systems throughout the United States have generously co-operated. These surveys, although they furnished most valuable data concerning the amount and location of generating capacity and transmission lines and indicated the probable loads to be carried in the coming year and the capabilities of the systems to meet such loads, could not take cognizance of the increased demand for power which might be occasioned by a war or an emergency similar to the one in which we now find ourselves.

Early in 1938, as a result of decreased expenditures for construction of new generating capacity over a period of several years, the Assistant Secretary of War became deeply concerned as to the adequacy of the existing supply of power to meet a possible war load. He then initiated additional power studies and eventually was appointed by the President as chairman of the National Defense Power Committee, which committee comprised in its membership the Assistant Secretaries of War and Navy, the Secretary of Interior, the chairman of the Federal Power Commission, the vice-chairman of the National Resources Committee and the chairman of the Securities and Exchange Commission. The National Defense Power Committee in addition to making a thorough study of the installed generating capacity, transmission capacity, past, present and prospective loads, etc., conducted the first real attempt to determine the power load which might be placed on the electric industry if war should occur.

The comprehensive investigation for the determination of the "war load increment" involved the mailing of many thousands of questionnaires to users of industrial power and subsequent analysis and interpretation of several thousand replies. Field checks by trained engineers were made in many areas.

Ran Into Difficulties

Although much extremely valuable information was gained which has been used in subsequent studies by the National Power Policy Committee, of which the Assistant Secretary of War is a member and which absorbed the functions of the National Defense Power Committee in October, 1939, the data could have been more complete and accurate if the persons supplying the information had all been familiar with technical terms or had consulted competent engineers. Too often kw.-hr., kw., kva. and hp. were hopelessly confused and inaccurate estimates of future power needs were made by employees of reporting concerns who were unfamiliar with technical phraseology and did not take advantage of their available sources of information.

This new survey by the Federal Power Commission, many details of which will be handled by several of the same trained engineers who formed the technical staff of the National Defense Power Committee, should reflect the benefits gained by their and industry's experience in the last survey. The time is opportune for a re-examination of the situation. Changing world conditions and modernization of our army have caused

major revisions in the procurement program.

Manufacturers or producers of munitions will benefit from the survey of the power needs for their individual plants. The utility industry, which has already given effective assistance in the planning of this survey, is presented with an unusual opportunity for service and profit whereby the industrial power sales engineers can effectively assist their customers in correctly answering the technical questions asked on the form, while at the same time gaining information concerning the possible extent and location of the potential power loads. Such information should be of real help in system planning. The government will gain by this co-operative effort in the assurance that the answers to the questionnaires will be substantially correct and that the power companies through their knowledge of potential loads will be on the alert to anticipate the incidence of such loads by providing, when necessary, the required additional generating, transmission and distribution facilities.

Forecasting Defense Power

Industrial survey now being made for assurance of ample power supply in essential munitions areas and to afford basis for adjustment of equipment orders to manufacturers' production schedules

LELAND OLDS, Chairman Federal Power Commission

THE Federal Power Commission's National Defense Industrial Power Statement is a part of the effort which the government has been making in recent years to assure adequate power supply for any major defense program which the critical world situation might force the country to undertake. In general, this effort has been based on the determination of all concerned to profit by the experiences of the World War and to anticipate requirements where provision for additional capacity may take from eighteen months to two years.

The experience of the World War revealed the ease with which the supplying of an army, coupled with unusual cold, unusual drought, or congestion in the transportation of coal, could bring the country face to face with a general power shortage. Actually, if the war had continued for another year the situation would have grown far more critical. As it was, essential production was at times curtailed by want of the energy which actuates our industry.

So, today, as the national defense program swings into full stride, the immediate problem becomes one of anticipating power shortages, which may develop in essential war material areas and sub-areas, sufficiently in advance to plan to have additional electrical equipment available when it is necessary. The efforts to deal with the problem have been greatly facilitated by the able report of Gen. Charles Keller, issued by the War Department in 1921. General Keller and his assistants analyzed the power situation in the years in which the United States was playing its part in the war and drew certain conclusions as to the outlines of a defense power program adequate to meet some future national emergency.

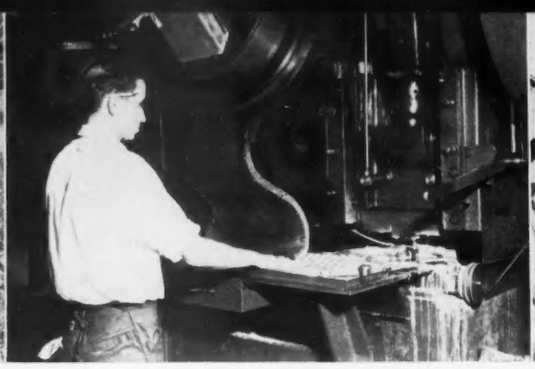
Five Years Ago

As early as 1935 the Federal Power Commission's National Power Survey report called attention to the fact that a resumption of industrial activity would lead to shortages in generating capacity and to the serious implications of the situation in terms of national defense. Out of this report developed intensive surveys of the matter by the National Defense Power Committee and the National Power Policy Committee. The staff of the Federal Power Commission provided the technical staff for this work, thus establishing a sound basis for the responsibilities which the commission has undertaken at the direction of the President.

The President, in his communication of June 14, 1940, called upon the commission, in co-operation with the National Defense Commission and the National Power Policy Committee, to translate national defense orders into demands for power, to keep check on the adequacy of the power supply to meet such demands, to keep currently informed of the needs of the national defense industries, to keep records of the orders being placed for electrical equipment, and to plan, in co-operation with the utility industry, to meet every power need in the most economical manner.

Willing Co-operation

In each step which it has taken to carry out these broad directions the commission has had the co-operation of the utility systems, both private and public. More especially, in formulating the questionnaires and forms for gathering the necessary information, it has been advised by representatives of important systems which have generously made their best men available for



the purpose. The commission hopes that such co-operation has made possible the accomplishment of practical results with a minimum burden to the utility and industrial organizations which are asked to co-operate in furnishing the data.

The National Defense Industrial Power Statement will be filled out by about 25,000 industrial plants, representing together approximately 80 per cent of the industrial power load of the country's major power systems. It is one of a group of questionnaires designed to afford a basis for forecasting load growth in the separate power supply areas and determining the availability of capacity to carry the additional load.

Results Already Obtained

Before turning to a brief discussion of the nature and purpose of the National Defense Industrial Power Statement, which constitutes the main subject of this article, a word must be said about the important results which are already flowing from one of the other questionnaires, the monthly power system statements which are being filed regularly by the utilities themselves. This is necessary because the forms sent to the power industry and the forms sent to industrial establishments supplement each other. Furthermore, the results obtained from the industrial statements should materially assist the utilities in anticipating the power requirements of their areas and sub-areas.

In fact, the returns from the two sets of forms, supplementing the more extensive data reported annually by the power systems, will enable the commission to answer, at short notice, almost any question concerning the power situation in any one of the 48 areas into which the country's power supply has been divided. In many instances these answers can eventually be given on a comprehensive basis simply by running a series of punch cards through the tabulating machine. As a result, areas in which power shortages are threatened, or may develop two or three years hence, will be readily detected and immediate steps taken to plan the most economical provision for the necessary additional capacity. Such planning will assure adjustment of orders for new turbine-generators to the production schedules of the heavily-loaded equipment industry.

The information compiled from the monthly power system statements is being transferred directly to charts, which reveal at a glance the trends in supply and demand for the individual power areas. Each area chart shows the trend of kilowatt-hour consumption extended to the end of the year by the estimates of the companies themselves, the trend of monthly peak demand extended on the same basis, the dependable capacity and the net assured capacity available to carry the load.

The net assured capacity line is extended to 1942, to include all generating capacity on order for installation within the period. The charts are already beginning to show which areas are amply supplied with power and those which threaten to develop critical problems of power supply.

The industrial power questionnaire now being sent will serve as a guide in anticipating loads to be expected in the next two years and as a basis for translating defense order dollars into kilowatt-hours. It has been reduced to the simplest possible terms and should not prove burdensome to the reporting industrial plants. In fact, the entire form, a completed sample of which is here reproduced, front and back, consists of a 5x8-in. card form.

Separate Plants

It should be emphasized that, where an industrial concern has several plants, a separate form must be filled out for each plant in order that the data may be properly related to the power load and capacity of the power system in whose area it is located.

The first four items which an industrial plant is asked to furnish, therefore, call for identification of the company which owns the plant, the proper designation of the plant as distinguished from other plants under

F.P.C. Form No. 170

NATIONAL DEFENSE INDUSTRIAL POWER STATEMENT
TO
FEDERAL POWER COMMISSION
WASHINGTON, D. C.

DO NOT USE THIS SPACE

a. This form should be filled out separately for EACH manufacturing and industrial plant of the company. The statement need not be filed for plants which have a connected load of less than 100 horsepower.

b. One original copy of the completed statement for each industrial plant should be returned to the Federal Power Commission, Washington, D. C., within 15 days.

c. Insert the word "none" where it is a true and complete answer to any particular inquiry.

RSA	SYS	IND	COMPANY	ST

1. Name of Operating Company: **The Superior Aircraft Co.**
2. Name of Plant: **Engine Plant**
3. Address of Plant: **114 Washington St.** (Street) **Baltimore** (City) (County) **Md.** (State)
4. Name, title, and address of official to whom correspondence concerning this statement should be addressed:
   James W. Stanley (Name - typewritten or printed) **President** (Title)
   The States Aircraft Corp. (Company) **10 Broadway, New York, N. Y.** (Mailing address if different from plant address)
5. Principal product of plant: **Aircraft Engines**
   (Be specific - for instance: if textiles, specify whether cotton, wool, silk or rayon, etc.)
6. Name of principal electric utility or industrial establishment from which electric power is purchased:
   Electric Utility Co.

10-28-40 (Date) _____ (Signature) **Gen. Mgr.** (Title)

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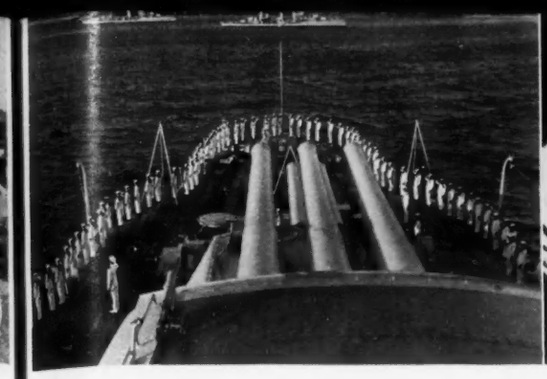


the same ownership, the official who will be responsible for any correspondence concerning the questionnaire and the name of the company of which he is an officer. Although the company indicated in the last-mentioned item will, in many instances, be identical with the company called for in item (1), the form affords an opportunity, where operating companies are subsidiaries of parent companies, for the returns to be made through the home offices of the parent company.

Goods Produced

Item 5 requests the reporting company to indicate the principal product of each plant. In general, the answer should correspond with that reported to the United States Bureau of the Census. The form suggests, as an example, that if the reporting company is engaged in some branch of the textile industry, the answer to this question should specify the branch. Where possible, further description of the product may be desirable. For instance, a cotton manufacturer should indicate whether the plant is engaged in carding, spinning, weaving or fabrication of cotton garments. Where a plant manufactures a considerable variety of products, the chief product or products should be entered with the further reference to "related products."

Item 6 simply calls for identification by name of the electric utility system from which the particular plant purchases all or part of its electric power. As there are a number of systems which have changed their names in recent years, care should be taken to enter the correct name for the utility in question.

The last six items on the reverse side of the card call for the basic data which will be compiled to constitute the contribution of this survey to the general power picture. Except as they call for estimates for the year 1941, they should not present any major difficulty.

Item 7, calling for the electric energy purchased by the plant, should be entered by calendar year of actual use, rather than as the sum of the energy figures on twelve monthly bills received during the year. As to the item calling for the highest hourly use of purchased energy during the year, the commission recognizes that the necessary records may not be readily available to all plant executives. Utility bills, however, will frequently show the maximum fifteen-minute or maximum thirty-minute demand during the month or other billing period, or have the demand charge based on the connected load of the plant. In any case, where there is doubt as to the answer, the power salesman of the local utility can assist in the determination of a reliably estimated figure.

Item 8 relates to the generation of electric energy by the industrial plant for its own use, for sale to others, and for interchange with the utility systems. The information desired is similar to that for the purchase of electric energy. It is probable that most industrial plants have sufficient information to supply either actual or adjusted figures from their records.

Energy Usages

Item 9 asks for the quantities of energy used in industrial operations. Where a plant purchases or generates all of its energy requirements, the answer is the same as the answer to item 7 or 8. Where a plant purchases and generates electric energy but does not deliver energy to others, the answer to item 9 is equal to the sum of the answers to items 7 and 8. There are, however, a few plants which purchase, generate, and sell or interchange electric energy. These plants, unlike the sample shown, cannot add the answers to items 7 and 8. They should correct for the amount of energy received in interchange arrangements and delivered either by interchange or sale arrangements. If adequate records are not available for those cases, where small quantities of energy are sold or delivered to residences around the plant, an estimated corrective figure should be subtracted from the sum of generated and purchased energy.

Item 10 asks for the approximate quantities of energy included in Item 9 for production of materials for the

Name of Company **Superior Aircraft Co.** Name of Plant **Engine plant**

The purpose of the following inquiry is to obtain information regarding present and future electric power requirements of industrial plants. It is requested that an earnest endeavor be made to supply estimates for the years 1940 and 1941.

ITEM (1)	UNIT (2)	CODES	ACTUAL 1939 (3)	ESTIMATED 1940 (4)	ESTIMATED 1941 (5)
		1			
		2			
7. Electric energy purchased		3			
a. Total amount purchased during year	Kilowatt-hours	4	1,105,264	1,350,000	1,500,000
b. Highest hourly use (maximum demand) of purchased energy during year	Kilowatts	4	251	270	280
8. Electric energy generated					
a. Output of generating facilities during year	Kilowatt-hours	5	2,212,197	2,700,000	3,000,000
b. Highest hourly output during year	Kilowatts	5	605	650	680
9. Energy used in Industrial Operations	Kilowatt-hours	6	3,317,461	4,050,000	4,500,000
10. Approximate quantities of energy included in Item 9, for production of materials for the United States Government on either Direct or Indirect Orders	Kilowatt-hours	6	1,100,000	1,800,000	2,100,000
11. Kilowatt-hours used in Industrial Operations (Item 9) per dollar value of products manufactured during year	Kilowatt-hours per dollar value	7	1.1	1.1	******
12. Capacity of electric generating facilities at plant (Name plate ratings)	Kilowatts	7	1,000	1,000	1,000
		X			

United States Government on either direct or indirect orders. Care should be exercised in estimating this energy and particularly for that part expended in production for indirect orders. This applies to the production of raw materials, parts, or semi-finished materials under subcontract with other industrial establishments which it is known will supply the finished or assembled material to the government.

Energy Used vs Product Value

Item 11 asks for the energy used in industrial operations per dollar value of products manufactured during the year. This is simply the total energy used in industrial operations entered in item 8, divided by the total value of products manufactured during the year. The answers will assist the government in ascertaining the quantities of electric energy required for the production of national defense materials and thus in determining the probable effect of specific orders for these materials on the power requirements of an area.

Item 12 asks for the capacity of electric generating facilities in each industrial plant so that the commission can have complete information regarding all generating capacity available to supply industrial requirements. With knowledge of the industrial generating capacity and utility generating capacity, it is possible more adequately to plan for the best use of the national facilities to generate electric power in accordance with the needs of both the defense program and civilian requirements for which adequate supply must continue.

These few statistical questions can be answered for the year 1939 with relatively little difficulty. The estimates for 1940 should likewise present little difficulty because records are available for ten months of the year. The answers will assist the commission in establishing the relationship between the requirements of individual industrial establishments and the system and area load curves. This will establish a broader basis for estimating the future requirements of the several areas as affected by the order books or prospective orders of the manufacturing industries.

Considerable care will be required in making the estimates for 1941, if these estimates are to be of value to the commission in its efforts to determine the amount and location of facilities for the generation, transmission and distribution of power to meet the needs of the defense program. Every effort must be made by plant executives to keep their estimates within the limits of what may reasonably be expected in 1941. Where questions arise they should be taken up with the power salesman of the utility supplying the electric service.

The estimates of highest hourly use of either purchased or generated power during 1941 should take into account the seasons in which the industrial operations normally reach a maximum for the particular plant. The probable variations in the level of operations during the year should also be considered in the estimates so that the annual energy requirement and the maximum demand, when taken together, will reflect load factors likely to be experienced.

Close Estimation

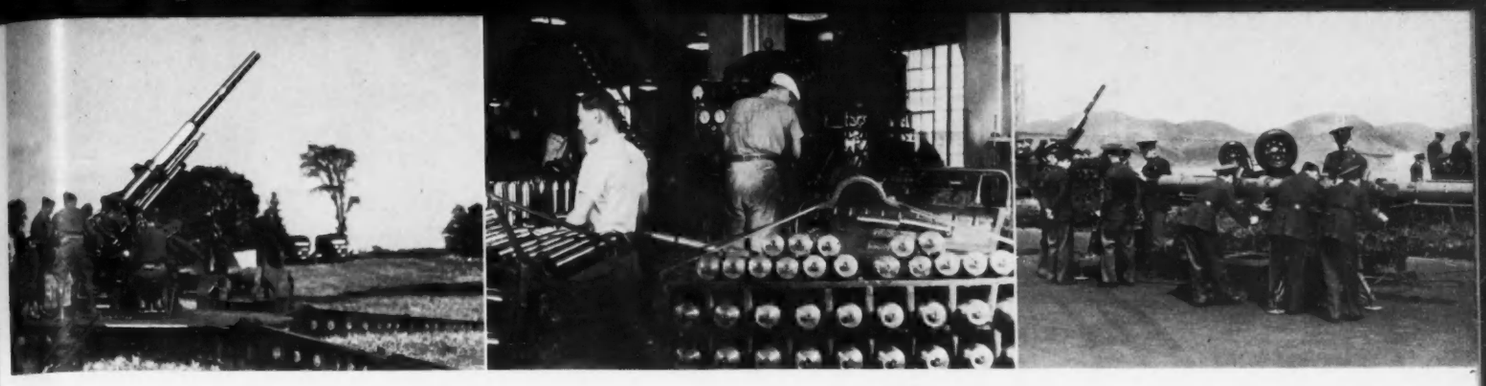
Particular care should be exercised in estimating the 1941 energy requirements for item 10. This estimate should be based on definite orders or definite information that orders for material will be placed in time to affect the power requirements of the plant during 1941.

As already indicated, the industrial power questionnaire is designed primarily to obtain information which can be used by the government and the electric utility systems to anticipate growth of load and resulting power requirements in time so that plans can be made to assure adequate supplies of electric power and energy, not only for the national defense program but also to meet the normal requirements of the entire people. The importance of such planning at this time is accentuated by need for fitting orders for additional generating capacity into order schedules of equipment companies which are carrying their share of the burden of defense production.

Care Is Required

The commission considers that the effectiveness of the survey will depend upon the care which is taken to supply the soundest possible answers in each case. To assure answers which present a realistic picture of the needs of each industry and each industrial area, it counts not only upon the co-operation of the industrial concerns which will make the replies, but also upon the threefold co-operation between representatives of the industrial companies, representatives of the utility systems supplying the power and the commission's own engineering staff.

Before final compilation of the answers, filed on the industrial power statement form, the commission's staff will check each return with the utility serving the area involved. In this way it is hoped that the conclusions as to the future demand for power will be kept within the bounds of reasonable expectation, in short, will represent realistic forecasts. The final results will be made available to the power systems for use in anticipating their requirements. They will also serve as a basis for further co-operation between the government and the power systems in plans for meeting those requirements.



Military Procurement and Purchasing

Instructions for manufacturers who wish to enlist their production in preparation for defense — How and where to get started in supply of army and navy requirements

ABOUT one-tenth of the requirements of any military establishment is specifically military; the rest is comprised of the ordinary goods of peace-time commerce, as is or slightly adapted from ordinary form. An army office desk is a desk; army socks are socks. Military procurement is not exclusively a matter of guns and munitions; it encompasses practically the whole range of industrial production.

Much Already Done

Negotiated contracts for many special and large items of military necessity have already been made. That is what the Advisory Commission for National Defense has been doing in recent months since the need for adequate armament became apparent to the nation. But in spite of the yeoman work of the commission, there still are requirements of vast proportions remaining unfilled. The major amounts of goods still required will be obtained through the established channels of military procurement and purchase. The purpose o fthis article is to indicate those channels so that any manufacturer who desires to undertake his share in defense production will know how and where to get started.

Army and navy procurement and purchase are separate. The navy is, so to speak, a going concern. Navy purchasing is, of course, enlarged from what it was before the present emergency arose, but the amounts and quantities are small in comparison with what the army will buy. So far as magnitude of necessities is concerned the army is starting practically from scratch.

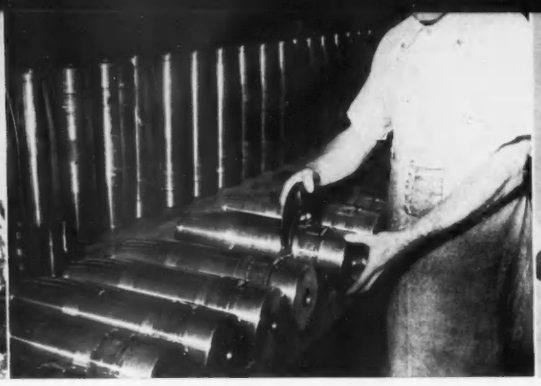
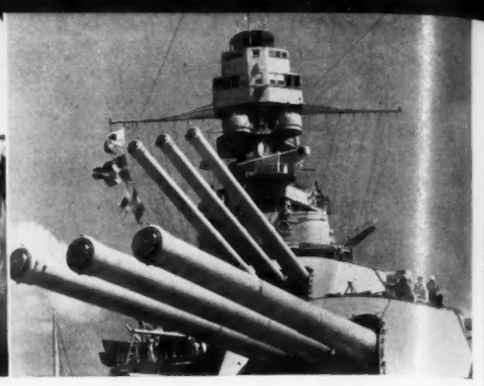
In an accompanying list are shown typical commodities regularly purchased by the navy. (This list and the other of army requirements are not complete, but are intended to be only indicative of what is needed.) Any manufacturer or other supplier who wishes to offer goods such as those listed has only to write to the bureau of Supplies and Accounts, Navy Department, Washington, D. C., asking to be listed to receive bid invitations and inclosing catalogues, selling folders or other descriptive material on the goods he makes or handles. The applicant is given a classification list on which he checks the items he wants to bid on. Then when the navy is in the market for these particular goods the applicant is invited to bid on them. A comprehensive exposition of navy purchasing procedure is contained in a pamphlet, "National Defense, Procurement Planning, Purchasing and Contracting (Revised) August, 1940," available from the Bureau of Foreign and Domestic Commerce, Washington, D. C.

What Goods Are Needed

The War Department has recently issued a pamphlet entitled, "Army Purchase Information Bulletin, 1940," from which and from the Department of Commerce publication previously mentioned instructional data have been arranged and are presented here. Under the heading "Army Requirements" is a list of manufactured goods and products needed for the army now building. This list is not complete; it is hardly more than indicative of army needs. Actually there are some 70,000 items on the supply lists of the army branches. And of these more than 90 per cent must be produced by industry, outside of arsenals and other army establishments. Any manufacturer who makes any of the products listed, who makes similar or allied products or whose manufacturing facilities can be employed in such production, even though his normal product may be entirely different, can participate in supplying army requirements. Following each item are

Navy Requirements

Special work to blueprints or specifications.
Fuel.
Automotive and railroad supplies for navy yards.
Boats, etc.
Pumps.
Oil, grease and lubricants.
Wire and wire rope, electric cable and wire.
Electrical appliances and equipment.
Electrical accessories, wiring and illuminating devices.
Radio equipment, accessories, parts and supplies.
Instruments of precision: All accessories, outfits and spare parts, etc.
Cordage, hemp, oakum, twine, etc.
Boat and ship supplies.
Furniture.
Dry goods, textiles, clothing, etc.
Dry goods: Gloves, insignia, shoes, etc.
Lighting apparatus (non-electric).
Fire-surfacing and heat-insulating materials, foundry apparatus.
Belting, gaskets, hose, leather, packing and rubber.
Musical instruments and all accessories; apparatus and parts.
Recreational apparatus.
Brooms and brushes.
Machine tools, accessories, outfits and parts.
Hand tools.
General hardware.
Non-ferrous materials.
Plumbing and steam fittings, bathroom accessories, valves, etc.
Iron and steel.
Sheet metal products.
Aircraft and aircraft materials.
Acids, chemicals, soaps, cleaning compounds, etc.
Paints, varnishes, etc., and ingredients.
Stationery, office equipment and supplies.
Foodstuffs.
Miscellaneous machinery and equipment for navy yard use.
Building material ashore.
Boilers, engines, etc.
Officers' and crews' mess gear and galley equipment; laundry apparatus.

Army Requirements

Adding machines—Q.C.
Aggregates—O.D.
Agricultural implements—Q.C.
Air-brake equipment—C.E.
Aircraft communications equipment—S.C.
Airplanes—A.C.
Airplane accessories—A.C.
Airplane equipment—A.C.
Airplane parts—A.C.
Aluminum and alloys—O.D.
Animal drawn transportation—Q.C.
Animal drawn vehicles—Q.C.
Apparatus, fire fighting—Q.C.
Arches, corrugated steel—C.E.
Automobiles—Q.C.
Automotive equipment—O.D.
Aviation fuel—A.C.

Bacon—Q.C.
Badges—Q.C.
Bags, burlap—C.E.
Bags, canvas—C.E.
Bakery equipment—Q.C.
Balances, sensitive—O.D.
Bars—O.D.
Bedsteads, barrack—Q.C.
Beef, frozen—Q.C.
Bicycles—Q.C.
Biologicals—M.D.
Blankets—Q.C.
Blank forms—Q.C.
Boats, Harbor—Q.C.
Boilers—C.E.
Boots—Q.C.
Brass—O.D.
Bridges, steel—C.E.
Bronze—O.D.
Building—C.E.
Buttons—Q.C.

Camouflage equipment—C.E.
Canvas—Q.C.
Caps—Q.C.
Cars, railroad—C.E.
Cartridge brass—O.D.
Castings—O.D.
Cement—O.D.
Ceramics—C.W.S.
Chairs, barrack—Q.C.
Charcoal, activated—C.W.S.
Chemicals—C.W.S.—M.D.
Chemicals, industrial—O.D.
Chemical plant equipment—C.W.S.
Cipher devices—S.C.
Cleaning and preserving materials—Q.C.
Clipping machines, horse and mule—Q.C.
Cloth, prepared—C.W.S.
Clothing—Q.C.
Clothing, Alaskan—Q.C.
Clothing, rubber—Q.C.
Copper—O.D.
Corned beef—Q.C.
Corned beef hash—Q.C.
Cots, canvas—Q.C.
Cots, steel—Q.C.
Cranes—C.E.

Dental equipment—M.D.
Dental instruments—M.D.
Dental supplies—M.D.
Desks, field—Q.C.
Diagnostic instruments—M.D.
Dies—O.D.
Drafting equipment—C.E.
Dredges—C.E.
Drugs—M.D.
Duck, prepared—C.W.S.
Dump wagons—C.E.

Electric plating equipment—O.D.
Engines, electric—C.E.
Engines, gasoline—C.E.
Envelopes—Q.C.
Explosives—O.D.
Explosive processing equipment—O.D.

Fabric components of gas masks—C.W.S.
Felt, prepared—C.W.S.
Field equipment, medical—M.D.
Field stoves—Q.C.
Filing cases—Q.C.
Filing equipment—Q.C.
Fire-fighting apparatus—Q.C.
Fire-control equipment—S.C.
Flags—Q.C.
Flour—Q.C.
Flying equipment—A.C.
Flying supplies—A.C.
Forage—Q.C.
Forgings—O.D.
Fuel, aviation—A.C.
Furnaces, heat treating—O.D.
Furniture, office—Q.C.

Gages—O.D.
Garage equipment—Q.C.
Gas masks—C.W.S.
Glass components of gas masks—C.W.S.
Gloves—Q.C.
Grinders—O.D.

Hand tools—C.E.
Harness—Q.C.
Hats—Q.C.
Heavy machinery—C.E.
Hoists—C.E.
Hospital equipment—M.D.
Hospital furniture—M.D.
Hydraulic presses—C.E.

Implements, agricultural—Q.C.
Individual equipment—Q.C.
Ingredient explosives—O.D.
Insignia—Q.C.
Iron—O.D.

Jacks—C.E.
Jigs—O.D.

Kitchen equipment—Q.C.

Laboratory equipment—M.D.
Laboratory stains—M.D.
Laboratory supplies—M.D.
Lamps, incandescent—Q.C.
Lathes—O.D.
Leather—Q.C.
Leggins—Q.C.
Lighting equipment—A.C.
Lithographic equipment—C.E.
Locomotives—C.E.
Lumber—O.D.

Machines—O.D.—C.W.S.
Machine tools—Q.C.—O.D.—C.W.S.
Malt—Q.C.
Matches, safety—Q.C.
Mattresses—Q.C.
Medical supplies—M.D.
Medical equipment—M.D.
Men's furnishings—Q.C.
Mess equipment—M.D.—Q.C.
Mess stools—Q.C.
Mess tables—Q.C.
Metal components—O.D.—C.W.S.
Meteorological equipment—S.C.
Molds—O.D.
Mosquito bars—Q.C.
Motor repair shop equipment—Q.C.
Motor transportation—Q.C.
Motor vehicle accessories—Q.C.
Motor vehicle equipment—Q.C.
Moulded rubber—C.W.S.
Musical instruments—Q.C.

Office devices—Q.C.
Oils—O.D.
Optical instruments—O.D.
Overcoats—Q.C.

Pack equipment—Q.C.
Paints—Q.C.—O.D.
Parachutes, equipment and instruments—A.C.
Photo-engraving equipment—C.E.
Photographic equipment—S.C.—C.E.
Physiotherapy equipment—M.D.
Pigments—Q.C.
Pillow cases—Q.C.
Plastics—C.W.S.
Plates, metal—O.D.
Power shovels—C.E.

Radio communication equipment—S.C.
Radio equipment—S.C.
Raincoats—Q.C.
Ranges, electric and gas—Q.C.
Refrigerators—Q.C.
Rods, metal—O.D.
Roofing—O.D.
Rope, cotton—Q.C.
Rope, manila—Q.C.
Rugs—Q.C.

Saddlery—Q.C.
Sawmills—C.E.
Scales, postal—Q.C.
Scales, weighing—Q.C.—O.D.
Scientific laboratory equipment—C.A.C.
Shapers—O.D.
Shapes, metal—O.D.
Sheets, cotton—Q.C.
Shoes—Q.C.
Shoe laces—Q.C.
Shoe lasts—Q.C.
Shooks, box—O.D.
Socks—Q.C.
Stampings, metal—O.D.
Steel—O.D.
Steel bridges—C.E.
Steel construction—O.D.
Stools, mess—Q.C.
Storage tanks—S.C.
Strapping, metal—O.D.
Subsistence—Q.C.
Supplies, general maintenance—O.D.
Surgical appliances—M.D.
Surgical dressings—M.D.
Surgical equipment—M.D.
Surgical instruments—M.D.
Surgical supplies—M.D.

Tables, mess—Q.C.
Telegraph equipment—S.C.
Telephone equipment—S.C.
Tentage—Q.C.
Textiles, cotton—Q.C.
Textiles, woolen—Q.C.
Thinners (paint)—Q.C.
Toilet articles—Q.C.
Tools, hand—Q.C.
Tools, machine—Q.C.—O.D.
Trailers—Q.C.
Transformers—C.E.
Trucks, cover—Q.C.
Truck curtains—Q.C.
Trucks, motor—Q.C.
Trunk lockers—Q.C.
Typewriters—Q.C.

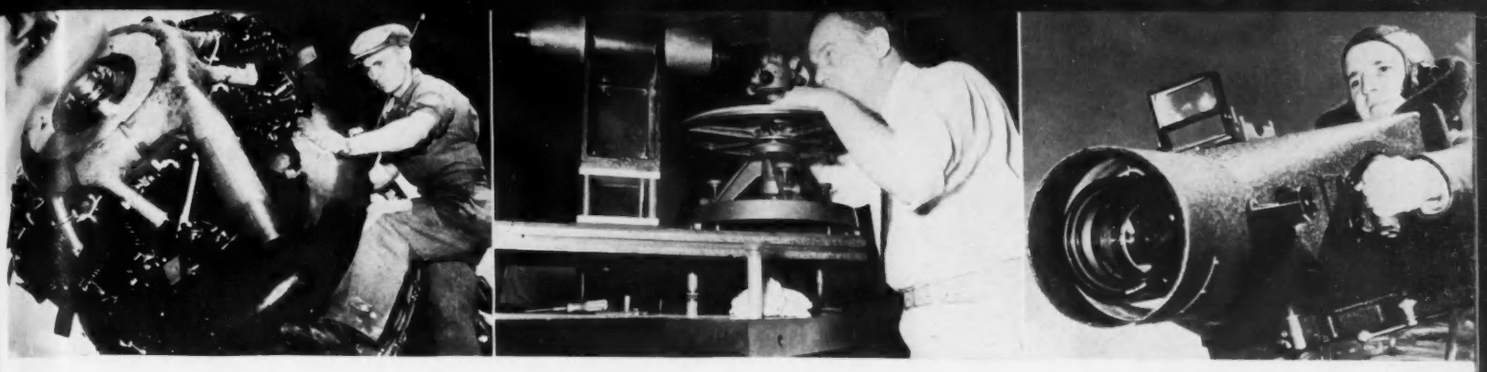
Underwear—Q.C.
Uniforms—Q.C.

Vehicles, animal drawn—Q.C.
Vehicles, motor—Q.C.
Vessels, marine—Q.C.
Veterinary equipment, instruments and supplies—M.D.

Wagons, dump—C.E.
Webbing, prepared—C.W.S.
White lead—Q.C.
Wire—O.D.
Wire and cable—S.C.
Wire and cable equipment—S.C.
Woodworking machinery—O.D.

X-ray machines—M.D.
X-ray supplies—M.D.

Yeast—Q.C.



initials showing which army branch or branches use or purchase the particular product.

Next comes a tabulation by states and state areas. Having learned from the list of "Army Requirements" the army branch that uses his goods, the manufacturer finds that branch in the column headings of the table and comes to a key number on the line of the state or state area in which his plant is located. This number identifies the nearest army procurement planning office in the list of addresses.

Thus having found the address of the nearest procurement planning office, the manufacturer may write,

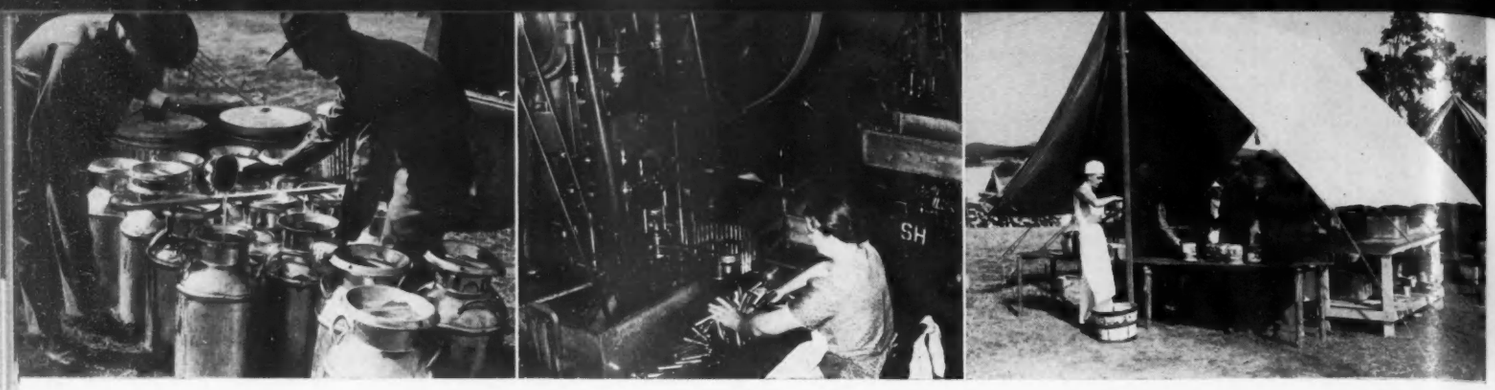
State Areas Related to Procurement Offices for Army Branches

	A.C.	C.E.	C.W.S.	M.D.	O.D.	Q.C.	S.C.	C.A.C.
Alabama	1	10	5	17	19	34	45	48
Arizona	3	14	8	18	31	42	46	48
Arkansas	1	10	5	17	30	41	45	48
California	3	14	8	18	31	43	46	48
Colorado	1	9	5	17	30	42	45	48
Connecticut	2	11	4	15	20	36	44	48
Delaware	2	12	6	15	27	40	44	48
Florida	2	10	7	15	19	34	45	48
Georgia	2	10	7	15	19	34	45	48
Idaho	3	14	8	18	31	43	46	48
Illinois (North)	1	9	5	16	21	37	45	48
Illinois (South)	1	9	5	17	30	37	45	48
St. Louis Area	1	9	5	16	30	41	45	48
Indiana (North)	1	9	5	16	21	39	45	48
Indiana (South)	1	9	5	17	22	39	45	48
Chicago Area	1	9	5	16	21	37	45	48
Iowa	1	9	5	16	21	41	45	48
Kansas	1	9	5	17	30	41	45	48
Kentucky	1	13	5	17	22	39	45	48
Louisiana	1	10	5	17	19	34	45	48
Maine	2	11	4	15	20	35	44	48
Maryland	2	12	6	15	27	40	44	48
Massachusetts	2	11	4	15	20	35	44	48
Michigan	1	9	5	16	24	37	45	48
Minnesota	1	9	5	16	21	41	45	48
Mississippi	1	10	5	17	19	34	45	48
Missouri	1	9	5	17	30	41	45	48
Montana	3	14	8	18	31	43	46	48
Nebraska	1	9	5	16	30	41	45	48
Nevada	3	14	8	18	31	43	46	48

	A.C.	C.E.	C.W.S.	M.D.	O.D.	Q.C.	S.C.	C.A.C.
New Hampshire	2	11	4	15	20	35	44	48
New Jersey (North)	2	11	6	15	26	36	44	48
New Jersey (South)	2	12	6	15	27	36	44	48
New Mexico	3	10	5	17	30	42	45	48
New York (North)	2	11	6	15	29	36	44	48
New York (South)	2	11	6	15	26	36	44	48
(Buffalo Area)	1	11	6	15	26	36	44	48
North Carolina	2	10	7	15	27	34	45	48
North Dakota	1	9	5	16	21	41	45	48
Ohio (North)	1	13	7	16	23	39	45	48
Ohio (South)	1	13	7	16	22	39	45	48
Oklahoma	1	10	5	17	30	42	45	48
Oregon	3	14	8	18	31	43	46	48
Pennsylvania (Eastern)	2	12	6	15	27	40	44	48
Pennsylvania (Western)	1	13	7	15	28	40	45	48
Rhode Island	2	11	4	15	20	35	44	48
So. Carolina	2	10	7	15	27	34	45	48
So. Dakota	1	9	5	16	21	41	45	48
Tennessee	1	10	5	17	22	34	45	48
Texas	1	10	5	17	30	42	45	48
Utah	3	14	8	18	31	43	46	48
Vermont	2	11	4	15	20	35	44	48
Virginia	2	10	7	15	27	40	45	48
Washington	3	14	8	18	31	43	46	48
West Virginia	1	13	7	15	28	39	45	48
Wisconsin	1	9	5	16	21	37	45	48
Wyoming	1	14	8	18	31	43	46	48

A.C.— Air Corps. C.E.— Corps of Engineers. C.W.S.— Chemical Warfare Service. M.D.— Medical Department.
O.D.— Ordnance Department. Q.C.— Quartermaster Corps. S.C.— Signal Corps. C.A.C.—Coast Artillery Corps.

1. Army Air Corps Central Procurement District, Wright Field, Dayton, Ohio.
2. Army Air Corps Eastern Procurement District, 90 Church Street, New York, N. Y.
3. Army Air Corps Western Procurement District, 506 Santa Monica Boulevard, Santa Monica, Calif.
4. Army Chemical Warfare Service Procurement District, 2000 Post Office and Court House Building, Boston, Mass.
5. Army Chemical Warfare Service Procurement District, 1113 Post Office Building, Chicago, Ills.
6. Army Chemical Warfare Service Procurement District, Room 404, 45 Broadway, New York, N. Y.
7. Army Chemical Warfare Service Procurement District, 1014 New Federal Building, Pittsburgh, Pa.
8. Army Chemical Warfare Service Procurement District, 117 Federal Office Building, San Francisco, Calif.
9. Army Engineer Procurement District, 1117 Post Office Building, Chicago, Ills.
10. Army Engineer Procurement District, 212 Wilson Building, Mobile, Ala.
11. Army Engineer Procurement District, 39 Whitehall Street, New York, N.Y.
12. Army Engineer Procurement District, Second and Chestnut Sts., Philadelphia, Pa.
13. Army Engineer Procurement District, 1012 New Federal Building, Pittsburgh, Pa.
14. Army Engineer Procurement District, 409 Customhouse, San Francisco, Calif.
15. Medical Department Procurement District, 58th Street and First Ave., Brooklyn, N. Y.
16. Medical Department Procurement District, U. S. Post Office Building, Chicago, Ills.
17. Medical Department Procurement District, Second and Arsenal Sts., St. Louis, Mo.
18. Medical Department Procurement District, The Presidio, San Francisco, Calif.
19. Army Ordnance District, 302 Comer Building, Birmingham, Ala.
20. Army Ordnance District, 2004 Post Office and Court House Building, Boston, Mass.
21. Army Ordnance District, 309 West Jackson Boulevard, Chicago, Ills.
22. Army Ordnance District, 521 Post Office Building, Cincinnati, Ohio.
23. Army Ordnance District, 1524 Keith Building, Cleveland, Ohio.
24. Army Ordnance District, 611 Federal Building, Detroit, Mich.
26. Army Ordnance District, Room 1214, 90 Church Street, New York, N. Y.
27. Army Ordnance District, 1417 Mitten Building, Philadelphia, Pa.
28. Army Ordnance District, 1032 New Federal Building, Pittsburgh, Pa.
29. Army Ordnance District, 1118 Mercantile Building, Rochester, N. Y.
30. Army Ordnance District, 935 Customhouse, St. Louis, Mo.
31. Army Ordnance District, 118 Federal Office Building, San Francisco, Calif.
34. Army Quartermaster Procurement Planning District, 1306 Twenty-Two Marietta Building, Atlanta, Ga.
35. Army Quartermaster Procurement Planning District, Quartermaster Depot, Army Base, Boston, Mass.
36. Army Quartermaster Procurement Planning District, First Avenue and 58th Street, Brooklyn, N. Y.
37. Army Quartermaster Procurement Planning District, 1819 West Pershing Road, Chicago, Ills.
39. Army Quartermaster Procurement Planning District, Tenth Street and Meigs Avenue, Jeffersonville, Ind.
40. Army Quartermaster Procurement Planning District, Twenty-First and Johnson Streets, Philadelphia, Pa.
41. Army Quartermaster Procurement Planning District, Second and Arsenal Sts., St. Louis, Mo.
42. Army Quartermaster Procurement Planning District, Quartermaster Depot, Fort Sam Houston, Texas.
43. Army Quartermaster Procurement Planning District, Fort Mason, San Francisco, Calif.
44. Army Signal Corps Procurement District, First Avenue and 58th Street, Brooklyn, N. Y.
45. Army Signal Corps Procurement District, 1819 West Pershing Road, Chicago, Ills.
46. Army Signal Corps Procurement District, The Presidio, San Francisco, Calif.
47. Bureau of Supplies and Accounts, Navy Department, Washington, D. C.
48. Coast Artillery School, Fort Monroe, Virginia.



describing his product—catalogues, mailing pieces, etc., should be enclosed if available—and stating the production capacity of his plant. If the manufacturer is interested in supplying goods different from his normal production, but which he can make readily, then this should be stated in sufficiently circumstantial detail so that ability to perform is clearly apparent.

The procedure here outlined is for the assistance of manufacturers who desire to do their part in furnishing goods for the army expansion now in hand. The manufacturer may wish to be listed as a supplier for the military establishment now existing. This establishment will continually increase, up to the limit of the appropriations voted by the Congress, and its demands on the industrial capacity of the nation will increase proportionately. If the manufacturer desires to be listed as a bidder on goods for these current needs, he should so state in his letter to the procurement planning office. He will then be put into touch with the particular purchasing agency concerned, from which he can obtain necessary information preliminary to bidding.

Power Salesman Is Industry's Ally in Defense

Suggestions of the many ways in which improvements to industrial efficiency may be offered to his customers by the wide-awake utility power sales engineer

FRANK R. INNES, Managing Editor

MAKE no mistake about it. This is no casual job we have undertaken, this task of equipping our country to speak in like and equal terms to nations that for years have been spending the toil and the wealth of their peoples on military power. To perform this task and at the same time to hold ourselves on the high living level we have attained will require the most intelligent application of industrial techniques of which we as a nation are capable.

It is the power salesman's regular job to show his customers how they can employ electricity more and more to their profit and advantage. Heretofore the power salesman has done this missionary work because that was what he was hired to do. By and large, he has done his work well. Much of the spread of modern techniques in industry is to be credited to the power salesman. In the exigency of today, however, it is not enough that the power salesman shall do his work well, thus profiting his customer and his employer. He must now do his work superlatively well, must put into it more and more intelligence and enthusiasm, must bring to it all the information he has and can obtain. For today the power salesman has a larger and a heavier responsibility than before; he is enlisted in defense with the soldier in training and with the workman turning out shells.

Every phase of electric service to industry must be examined, investigated, checked over, for assurance that no reasonable opportunity is overlooked for betterment of working conditions, for labor saving, for cost reduction, for operating improvements, for any and all ways to enlarge production and make it more efficient.

The first concern of the power salesman is that his industrial customers have an adequate and economical supply of electricity. And first in this is the responsibility of the utility to the customer, in which is included ability to supply the customer's present and probable future power needs in terms of quantity and quality of service.

Lowest Cost for Service

Another important aspect of the utility responsibility is seeing to it that the customer is billed on the rate form that gives him electric service at the consistently lowest net cost. Studies of the customer's bills, of his uses of electricity, of conditions of operation and of possibilities of demand control and of power-factor correction are indicated in this connection.

No less important than the utility's is the customer's own responsibility in regard to adequacy and economy of power supply. Foremost in this consideration is distribution on the customer's premises, specifically building wiring, although in large plants the subject may cover substations and overhead and underground distribution.

Wiring systems installed some years ago are often found to be considerably overloaded throughout, or at one or more points, as the result of additions to or rearrangement of production facilities. Voltage drops so caused may be so great from service entrance to points of use as seriously to impair efficiencies of lighting and of motor operation.

These conditions can be corrected sometimes by looping or adding feed-

ers, by rearranging circuits, by uses of oil-less transformers and by replacement of existing conductors in conduits with more and larger wires covered with the new thin-wall insulation. Segregation of welding and other short-time, heavy-draft loads on separate circuits is often helpful.

It is useful frequently to look at industrial plant wiring from the points of view of its flexibility in relation to possible changes in production facilities and of its capacity for extension to care for additions to these facilities.

Another consideration is the exposure of electricity supply equipment, transformers, breakers, protective devices and meters, to dangers of fire, flood, sabotage and other ways of damage. This is a matter that often does not receive attention until damage occurs.

In many large industrial plants, it may, perhaps, be assumed that the electrical system is kept in good shape by systematic and regular inspection and maintenance. But sometimes in these and almost always in smaller plants proper functioning of the electrical system is taken for granted until something goes wrong or conditions become very bad. A good checking over will often forestall trouble along this line.

Motor Applications

Probably a greater improvement in efficiency of electricity use in industry could be accomplished by proper matching of motors to drives than by any other means. Designers, shop superintendents, all who are occupied with production, want to be sure that the motor is big enough to drive the machine. The result of this concern is a large proportion of overmotoring, with consequently reduced drive efficiency, low power factor and poor voltage regulation. On the other hand, overloaded motors are not infrequent either. It is therefore quite possible in a given industrial plant that considerable improvement in efficiency of motor uses can be accomplished by exchanging motors between different drives. This of course is a matter of determination of drive requirements and of matching motor sizes and characteristics to them. In many cases the purchase of new motors will be profitable.

The large resources of motor control, comprising automatic devices, interlocks, limit and level switches, phototube and other electronic equipments, relays responsive to thermal, electrical and other conditions, offer many opportunities for facilitating and increasing industrial production.

Fusing and other overload protection of motors will repay study in many instances. Time-delay characteristics in fuses and circuit breakers will prevent momentary overloads from interrupting service, shutting down machines and delaying production, while still giving protection against real trouble.

Lighting

What was considered good lighting yesterday is often far from the ideas of good lighting today. Improvements in older light sources and availability of new ones make it possible now for lighting installations to be designed much more closely to the seeing requirements of work than could be done heretofore. Light intensities stated in hundreds instead of in tens of foot-candles are proving their value in better and faster work and in significant reduction of worker fatigue. Dependence on daylight in industrial operations is becoming less and less, as is evidenced by the growing number of window-less factories.

Consideration of improvement of industrial lighting in any given instance should first cover certain primary matters in connection with the existing installation. Cleanliness of lamps, glassware and reflectors is the beginning of improvement. Attention to that simple thing may work apparent wonders. Replacement of deteriorated, blackened lamps is often greatly worth while. Use of higher wattage lamps will help a lot. Checking voltages at lamp sockets may furnish evidence that circuits are overloaded and that some conductors can be pulled out and larger ones pulled in to great improvement in lighting.

New Light Sources

It may be apparent that nothing can be done with or to the existing installation if really good lighting is to be supplied. If so, then informed consideration should be given to the advantages of the new light sources now available. But remember that these new sources have limitations as well as advantages. Cost is the first limitation. This is becoming less restrictive as time goes on and production and use of the new lamps increase.

In looking over an existing lighting installation the first consideration is of quantity and quality of light.

Are foot-candle intensities in line with modern standards of illumination for the particular work?

Does glare, direct or reflected, get into the workers' eyes, impairing vision, causing headaches and shortening tempers?

Are shadows obtrusive and confusing?

Are light sources poorly positioned, distracting images of them appearing on polished surfaces?

Are details of work difficult to distinguish?

Are walls, ceilings and production equipment contributing their important share to good lighting or are they dark and dingy?

And, finally, do not overlook the fact that light is the most effective and the lowest cost policeman that can be hired. In these times, when the skulking figure of the saboteur haunts the dark, light is the best protection against his malice. Adequate pro-

tective lighting of industrial properties is a duty and a necessity for production efficiency.

Heat Applications

Electric heat, with its advantages of safety, exact control and extreme flexibility of form and size, is doing much and can do much more in improving and increasing industrial production. Its possibilities of application have not yet been completely explored. Not only is it capable of replacing combustion heat in practically all industrial applications, but it is finding ways to work impossible to the latter.

For requirements of heat in large volume electricity cannot compete with combustion except in special cases. However, these special cases are sufficiently numerous to be frequently encountered. The commonest use of heat—for human comfort—offers many such opportunities in industry where the well-being of workers at their work is such an important factor in production efficiency. A few electric heaters, of convection, reflection or fan type, as may be desirable in the circumstances, are effective for short-time use in morning and evening chill and at places so exposed as to make ordinary heating difficult or unsafe.

Along the production lines of many industries are a succession of opportunities to realize the advantages of close temperature control and of divisibility into small units that characterize electric heat. Needs for small quantities of steam and hot water, for holding compounds, glue and solder at optimum temperatures and for warming or drying work in process offer scope for employment of small strip and immersion heaters. Oil, electrically heated to exact temperature and pressure circulated, has been found to be a very successful heat conduction medium for certain asphaltic compound dipping baths.

All painting, enameling and coating processes should be closely studied for possibilities of drying by the newly developed infra-red method. There are chances for employment of induction heating also in this field.

Heat-treating processes will repay close study by the opportunities they offer for electricity. Controlled atmosphere furnaces are the obvious answer here.

Surface hardening by induction heating, each piece treated separately, has demonstrated much greater speed of production than batch treating in a furnace. By the induction method the hardening can be confined exactly to the area where it is needed and the depth of penetration be as exactly controlled.

In production operations in which welding is a large factor it will be worth while in many cases to give particularly attention to supply of electricity for this service. Segregated circuits, designed especially for low impedance to the sharp and heavy current drafts, will give better welding performance and at the same time remove annoying and sometimes troublesome electrical disturbance from lighting and power distribution.

Air Conditioning

As an element in production, to hold materials in process in certain optimum conditions of humidity and temperature, air conditioning has long been employed in industry. But as yet the values of air conditioning in keeping workers comfortable and alert and in just plain cleanliness of plant and product have not been fully appreciated.

Ventilation is the first factor in air conditioning. Dust hanging in the air slows up any kind of work. Some industrial operations are dusty by nature and usually, but not always, means are provided to keep the air clean. The "not always" cases are frequent enough so that ventilation can be regarded as something to be considered in ways to improve industrial efficiency.

Apart from cleanliness, there is to be considered the problem of stale, vitiated air which makes any one sleepy and inattentive. This is a condition too common in industrial plants. Efforts to correct it will be fruitful in bettered production.

Beyond the matter of clean, fresh air, the problem of air conditioning is an affair for the specialist. But in this elementary consideration the power salesman can do much for his industrial customers.

Information

Parallel with the application of electric power to industrial processes is the matter of keeping track of how the power is used and of the results of its employment. Over-all costs of power supply are not sufficient for competent industrial accounting. Departmental costs are necessary if economy control of the business is to be maintained. And only by such control can the maximum of efficiency be realized. Therefore, one way in which the power salesman can help his industrial customers is to impress upon them the necessity for collection of operating facts as revealed by instrument records of costs.

Another value of instrumentation in industry is that of analysis of operations. The knowledge thus gained is useful in co-ordinating operations so that an even flow of production can be realized. Also, such knowledge is often helpful in rationalizing the physical efforts of workers, with consequent reduction of fatigue and betterment of work.

All that has been said in the foregoing amounts to no more than a sketchy summary of the power salesman's regular job. But brief and superficial as this article is, the reading of it cannot help but benefit even the best power salesman. These random notes may well serve to bring forgotten knowledge back to mind.

Process Heating Uses Oil for Heat Transfer

Insulation board production doubled and labor costs halved — 114.5 kw. of electric heating using oil as transfer agent provides 500 deg. F. temperature for melting asphaltic compound

ROBERT M. HERMANN, Montgomery Brothers, Portland, Ore.

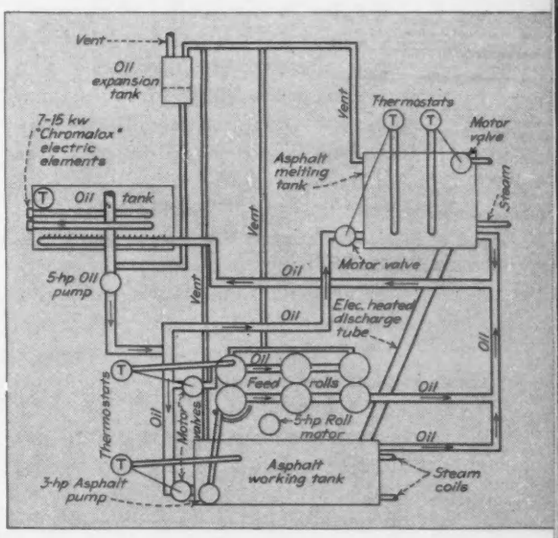
CIRCULATION of oil heated to 500 deg. F. by means of 114.5 kw. of electric heaters has permitted the Fir-Tex Insulating Board Company of St. Helens, Ore., to use Gilsonite as a covering for certain of its products, more than doubling machine production and cutting labor costs in half, as well as producing an insulating board possessing many advantages over former types. Use of light oil as a heat transfer medium in this instance demonstrates a new technique of high temperature heating for which many applications may be developed.

Sticky Asphalt

Two years ago the Fir-Tex company designed a machine for applying an asphalt coating to certain types of insulating board. Steam was used to melt the asphalt and keep it sufficiently thin to be pumped over the machine rolls for application to the board. The rolls themselves were also heated by steam at 150-lb. pressure. However, several obstacles developed. So much time was required for the asphalt to set so as to prevent the boards sticking together when stacked that production was slow. Sprinkling of fine mica dust over the board alleviated some of these difficulties, but it was found that sticking occurred even then. Also, during summer months the same difficulty occurred in transcontinental carload shipments when temperature inside the cars rose as high as 140 deg. This caused a heavy loss of product.

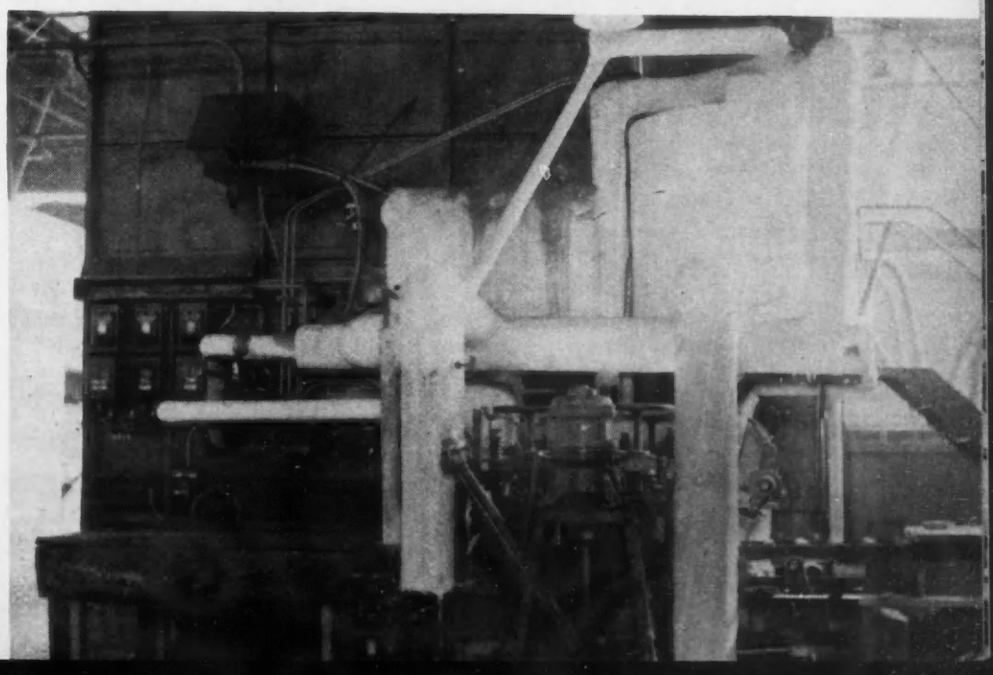
In searching for a remedy the company experimented with Gilsonite, a new type asphaltic compound, which overcame the sticking problem. In order to be applied successfully, Gilsonite had to be heated to 500 deg. F. To reach this temperature superheated steam at 604 lb. pressure would be required. This meant not only redesigning the machine for such temperatures and pressures but also the installation of a new boiler plant.

Immersion type electric heaters installed directly in the compound were suggested, but it was discovered that Gilsonite would char at 550 deg. Surface temperature of the heater blades would be in excess of this figure. To solve the difficulty F. W. Dolbow of Montgomery Brothers and A. L. Apperson of Portland General Electric Co., the serving utility, developed a heat transfer system using oil at high velocity of flow as the transfer agent.



SCHEMATIC DIAGRAM of electrically heated oil system for tanks and rolls which produces insulating board better and faster than steam-heated system.

MACHINE for producing asphalt-covered insulating board showing electrically heated oil tank in foreground and asphalt tank at rear. Oil pipes are heavily insulated because of 500-deg. temperature



This not only produced the desired temperature but also permitted the use of the existing steam installation for pre-heating and involved only minor changes in the machine.

A 36-in. diameter by 52-in. oil tank was equipped with seven 15-kw., 480-volt, six-blade Chromalox immersion heaters. The 41¾-in. blades gave a heating surface density of 16 watts per square inch and permitted the use of light oil (Penn. SAE No. 10 heavy duty). This oil has a specific heat of 0.69 at 500 deg. F. and a flash point of 575 deg. F. A total of 325 gal. was required to fill the tank and circulating system.

Oil Circulation

Circulating coils were installed in the upper melting tank and the lower working tank and the hot oil also was piped through the revolving feed rolls of the machine. Welded copper tubing was used for the coils, 350 lin. ft. 1½-in. o.d. being installed in the upper tank and 250 lin. ft. 1¼-in. o.d. in the lower. The heat transfer from the oil through the copper coils was found to be about 50 B.t.u. per square foot of surface per hour per degree difference in temperature. A 5-hp., 3,600-r.p.m. hot-oil type circulating pump was installed to give the necessary velocity of flow. Full automatic control was obtained through the use of thermostats and motor-operated valves in the oil and steam lines. Steam is only used for preheating the Gilsonite after a shutdown.

To maintain the temperature of the Gilsonite between the melting and working tanks and between working tanks and rolls 9.5 kw. of strip heaters were applied to the pipelines.

Coating Method

In the final process the Gilsonite is pumped from the working tank to troughs which feed the first set of rolls. Insulating board is fed between the rolls where it receives a coating of the compound. The second and third sets of rolls act as feeders, wipers and impregnators. By the time the board reaches the off-bearing platform the temperature has dropped sufficiently to allow stacking without sticking. The use of mica dust has been eliminated entirely. Capacity is 6,000 sq.ft. per hour, more than double that of the steam-heated installation originally used. This could be increased with some change in the facilities for feeding and off-bearing. Labor costs have been halved. Other advantages include a more evenly and thoroughly coated board and a reduction in the number of rejects. In addition the over-all cost of the electrically heated installation was much lower than one employing superheated steam.

Integrated Program Improves Reliability

[*Continued from page 44*]

Four 2,000-kva. non-inflammable, liquid-cooled transformers feed the six-section, 550-volt auxiliary system ring bus from the 13.2-kv. house service bus. These replaced five 1,800-kva. oil-filled, water-cooled indoor transformers of the old system which were installed in vaults on the first floor of the switch house. Since these vaults were not ventilated or provided with fire-fighting equipment they created a fire hazard. With the installation of four 2,000-kva. non-inflammable, liquid-cooled units a large saving could be effected through reduction of electrical losses, elimination of cooling water and the elimination of investment charges on equipment required to ventilate the vaults and on fire-fighting equipment.

Six-Section Ring

As stated, the old 550-volt station auxiliary bus layout was converted to a six-section ring bus with a 2,000-kva. transformer feeding each of four sections, a 1,500-kva. house turbine is connected to the fifth section and the sixth is without an independent source of feed.

Complete differential protection was provided on the ring bus and also on transformers and house turbine feeding the bus. Back-up and overload relays on the load buses will take out the section of the ring bus to which it is connected in case of a fault on the load bus. The 2,000-amp. tie breakers between sections of the ring are equipped with instantaneous magnetic trips to operate at 30,000 amp. This is also true of the transformer breakers. The breakers on the feeder circuits from the load buses have magnetic trips set to operate at 7,500 amp. and each circuit feeder is equipped with overload relays.

Oil circuit breakers on the old 550-volt station auxiliary bus carried an interrupting rating of 30,000 amp., but later were derated to less than 10,000 amp. Possible short-circuit current at the bus with more than one transformer feeding the system was 34,000 amp. Therefore it was imperative that they be revamped. The scheme finally adopted was replacement of 99 oil circuit breakers with 79 air-break switches, eleven of which were 2,000 amp. with 60,000 amp. rupturing capacity and the balance 400 amp., 40,000 amp. rupturing capacity. The old pipe frame structures used to carry the oil breakers was utilized with practically no changes for mounting the new air breakers.

Lowered Maintenance

Tanks of the original 99 oil breakers on the third floor of the switch house contained a total of 2,000 gal. of oil, which constituted a serious fire hazard. The switch rooms were large, with high ceilings; therefore, fire protection would have been difficult and costly. This was another disadvantage and a factor in favor of the air circuit breaker. After several months operating, cost figures show that the maintenance on the new breakers will be about one-fifth of that which was required for the oil switches.

At the time of the replacement of breakers and revamping the bus layout a number of changes were made in the location of the more important motor circuits fed from this system. Draft fans and coal mills for a boiler are all connected to the same load bus. The boiler feed pump motors are connected one to each of several load buses. By this scheme of grouping a fault on any load bus will confine the disturbance to a minimum of station apparatus.

Indoor through-type current transformers with low-current induction-type over-current relays were used in the differential protective scheme on this layout. Ratio differential relays were used for protection on all power transformers and cables feeding the 550-volt as well as on the 2,300-volt station auxiliary set-ups.

Four-Year Record of Lighting Promotion

Data on energy used by a large and representative group of customers permits evaluation of effectiveness of promotional efforts in residential lighting

MERRILL E. SKINNER,* Buffalo Niagara & Eastern Power Corporation

No comment is needed to amplify the story of lighting sales of the Buffalo Niagara & Eastern Power Corporation told by the curves and data on this page. The organization and its performance are clearly shown. But perhaps a small amount of additional information may be useful.

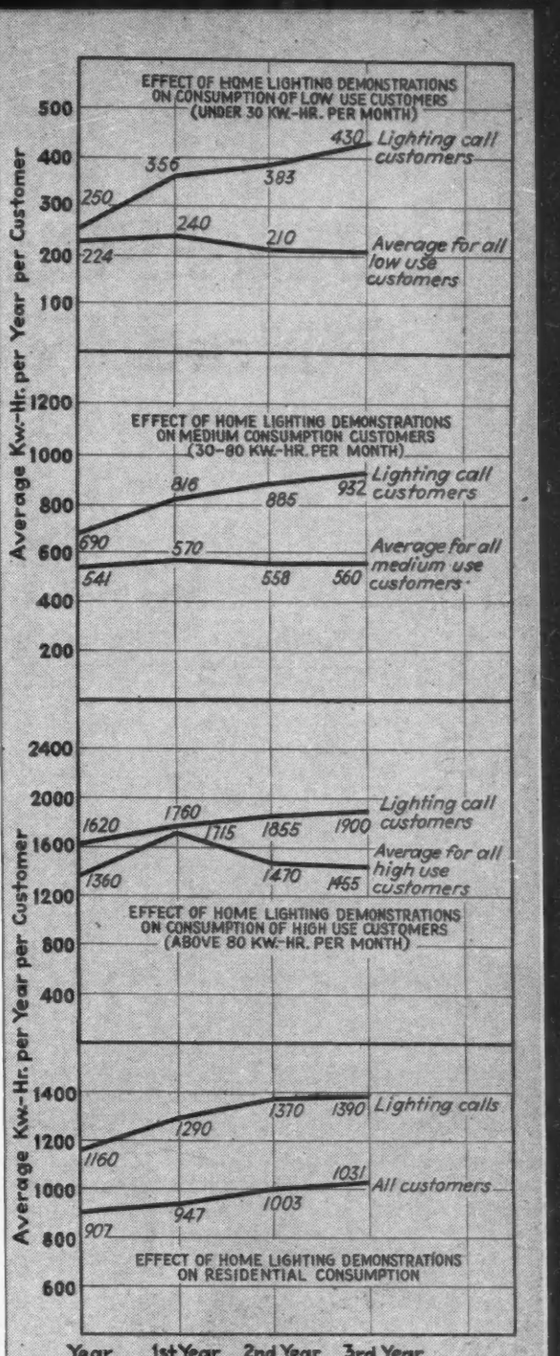
As of April 30, 1940, the company served 253,836 residence and farm customers, 33,955 commercial and 858 industrial. The loading on the field contact organization was:

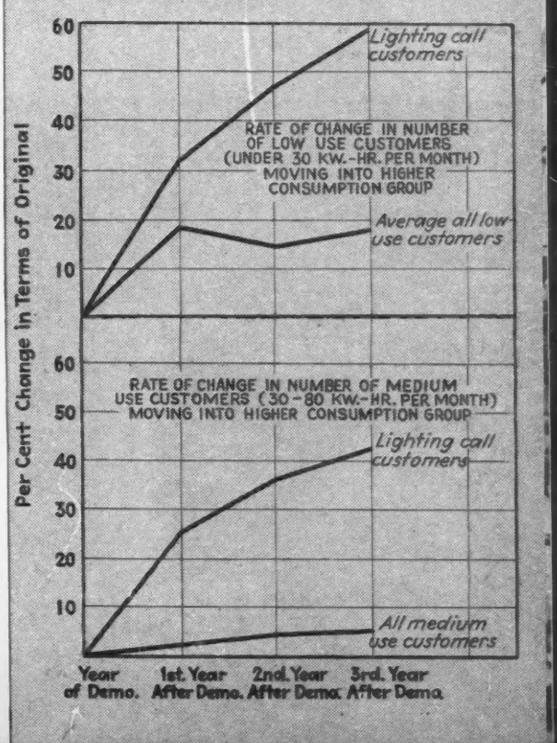
	Customers per Contact Employee Outlying Districts			
	Buffalo	Max.	Ave.	Min.
Home lighting	8,800	21,000	9,800	8,800
Commercial lighting	2,599	3,600	2,170	1,500
Industrial lighting	210	Inc. in commercial light.		

For four years a close record has been kept of changes in energy con-

[*Continued on page 127*]

*Vice-president.
From paper to Canadian Electrical Association.




RATE OF CHANGE IN NUMBER OF LOW USE CUSTOMERS (UNDER 30 KW.-HR. PER MONTH) MOVING INTO HIGHER CONSUMPTION GROUP
Per Cent Change in Terms of Original
Lighting call customers
Average all low use customers
RATE OF CHANGE IN NUMBER OF MEDIUM USE CUSTOMERS (30-80 KW.-HR. PER MONTH) MOVING INTO HIGHER CONSUMPTION GROUP
Lighting call customers
All medium use customers
Year of Demo.
1st Year After Demo.
2nd Year After Demo.
3rd Year After Demo.

Home-Lighting Accomplishment

	1936	1937	1938	1939
Demonstrations				
Quota	10,000	15,600	13,275	13,650
Actual	9,652 or 97%	12,767 or 81%	12,851 or 97%	13,843 or 101%
Kilowatts				
Quota	2,800	4,212	3,577	3,307
Actual	2,616 or 93%	3,200 or 76%	3,071 or 86%	3,491 or 105%
E.A.R.				
Quota	42,500	49,908	43,863	43,252
Actual	35,167 or 83%	42,385 or 85%	38,385 or 87%	45,512 or 106%

Engineering Section Summary

	1935	1936	1937	1938	1939
Commercial and industrial layouts	305	255	381	370	424
Residential layouts	...	...	222	428	475
New equipment designs	2	12	22	61	73
Equipment tests	47	43	45	75	85

Commercial and Industrial Lighting Accomplishment

	1935	1936	1937	1938	1939
Kw. quota	1,750	1,800	3,550	4,447	4,704
Kw. increase	2,900	3,800	5,100	5,146	5,161
Kw.-hr. quota	4,000,000	.....	6,500,000	8,100,000	8,600,000
Kw.-hr. increase	4,200,000	6,900,000	9,990,000	9,243,132	10,568,785
E.A.R. quota	$60,000	$86,000	$118,300	$133,230	$148,280
E.A.R. actual	$12,000	$128,000	$156,000	$153,691	$160,683

Efficiency Factors

Average kw. added per job	2.9	2.46	4.	4.3	5.2
Number of calls per job	14.5	10.	9.5	13.5	19.8
Average burning hours of added load	1,450	1,910	1,960	1,800	2,004
Average rate at which new load is added	$0.0195	$0.0191	$0.0156	$0.0166	$0.0152
Average E.A.R. per kw. added	$28.00	$36.70	$30.70	$29.80	$31.20
Average cost per dollar of E.A.R.	$0.83	$0.76	$0.51	$0.63	$0.53

Home-Lighting Efficiency Factors

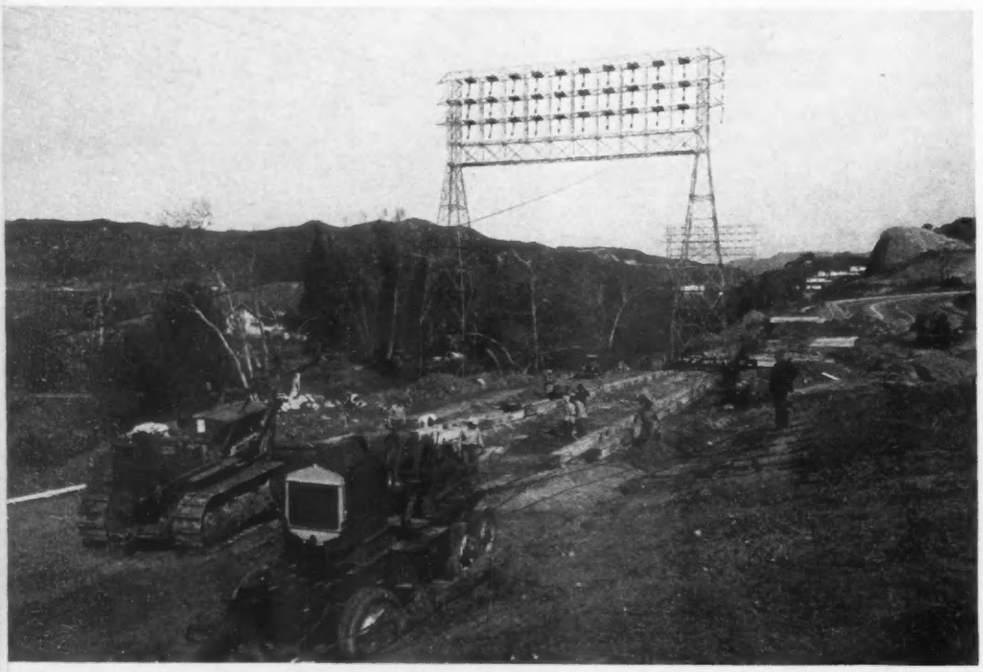
	1935	1936	1937	1938	1939
Adviser days/adviser	90	216	277	244	240
Demos. per adviser day/adviser	1.77	1.72	2.	2.2	*2.3
Additional watts recommended per demo	422	463	500	540	†490
Est. additional watts installed per demo	163	271	256	266	‡266
Average rate at which new load is added		$0.0176 per kw.-hr.			
Average cost per dollar of E.A.R.	....	$2.40	$2.15	$2.11	$1.81
Average E.A.R. per demo	....	$3.65	$3.30	$3.08	$3.13

* Buffalo only — full-time adviser 2.5.
† Buffalo only — full-time adviser 524
‡ Buffalo only — full-time adviser 274

Eleven-Circuit Structure Moved With Lines Hot

Highway realignment job necessitates moving a tower structure 130 ft. high with a 50-ton conductor load a distance of 212 ft.

C. T. MALLOY, Southern California Edison Company, Los Angeles, Calif.*



GENERAL VIEW of operations. One complication was the fact one supporting tower was 15 ft. longer than the other

MANNER in which I-beams were attached to footing plates

A 130-FT. steel tower structure, carrying 33 conductors for a combined weight of 100,000 lb., was successfully moved by Southern California Edison Company recently with circuits energized and with the introduction of less than 1 in. of distortion in the structure.

The move was made necessary by a proposed highway realignment which found one of Edison's towers situated in the middle of the proposed new route. This was on El Modena Avenue, in Eagle Rock, near Los Angeles, and the new location was such that the tower had to be moved 212 ft.

The structure involved was one of those carrying the 11-circuit line through Eagle Rock and, like the other structures there, consists of two towers, 100 ft. from base to base, connected by a bridge which supports the conductors. Nine of the circuits are 66 kv. and two are 16 kv. and each is composed of three No. 4/0 stranded copper conductors under an

* Superintendent of Transmission and Communication.

The structure itself was made ready by securing a 12-in. I-beam to each transverse face of each supporting tower at the footing plates. Two screw jacks were used at each corner to raise the structure, and while raising was taking place, position was checked by a wye level at each end structure. Timbers of 14 x 16-in. section were bolted under the I-beams inside and outside the tower legs on each longitudinal face. These rested on the rollers.

Pulling lines were attached at the top of the front I-beam and run to a gasoline-driven hoist. A separate hoist was provided for each end structure. Longitudinal guys were attached front and back at the level of the middle conductors and were run to separate hoists for each end structure. Four hoists were used in all. Safety guys were placed in both transverse and longitudinal directions.

approximate tension of 2,000 lb. at 75 deg. F. The structure weighs 68,-500 lb. and supports 31,500 lb. of conductors.

To have built a new structure and dismantled the one obstructing the new highway would have required outages of many hours' duration. As the use of the lines was important to the system, attention was turned to moving the structure with the lines energized.

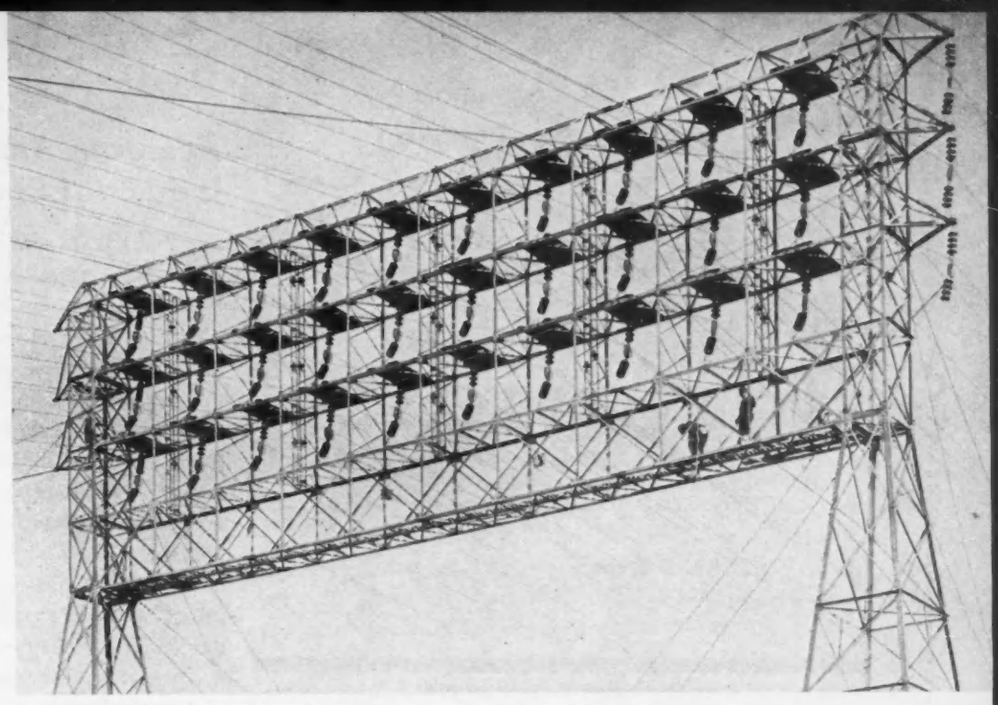
Experts in the moving of heavy equipment, houses and buildings were consulted and gave the opinion that, while the structure was heavy and somewhat topheavy, it could be moved without difficulty and without approaching the limits of distortion prescribed by Edison engineers. Pacific Crane & Rigging Company undertook the work.

The actual moving time was only one hour, but eighteen days were devoted to preparation for the job. An instance of how foresight paid out occurred in connection with providing drainage.

The tower was situated in one of those southern California canyons which are subject to flash floods following rains. Hence it was decided to divert the channel of the canyon stream to prevent possible damage to the roadbed on which it was planned to move the tower. As it turned out, a storm took place only 36 hours prior to the time scheduled for moving. Because of the preparations, no damage was inflicted on the roadbed, and the job proceeded according to schedule.

Some 2,500 cu.yd. of earth was moved in and well-compacted to form the roadbed. On the roadbed were laid 6x8-in. ties, which supported rails consisting of two 12x12-in. timbers. These were laid to a tolerance of $\frac{1}{8}$ in., both in line and grade. The tower was moved along these rails, on 7-in. orangewood rollers.

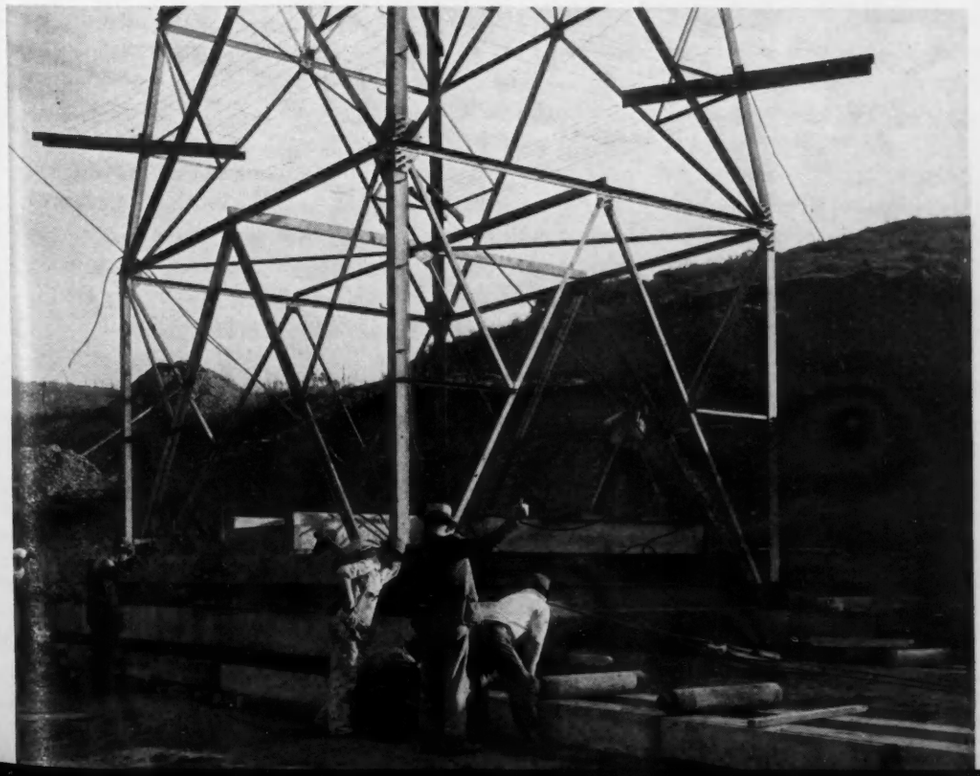
Cost of the entire job amounted to less than half the amount appropriated for replacing the old tower. More important, the job was completed without interruption or jeopardy of service, and without personal injuries or property damage. Careful planning paid dividends.



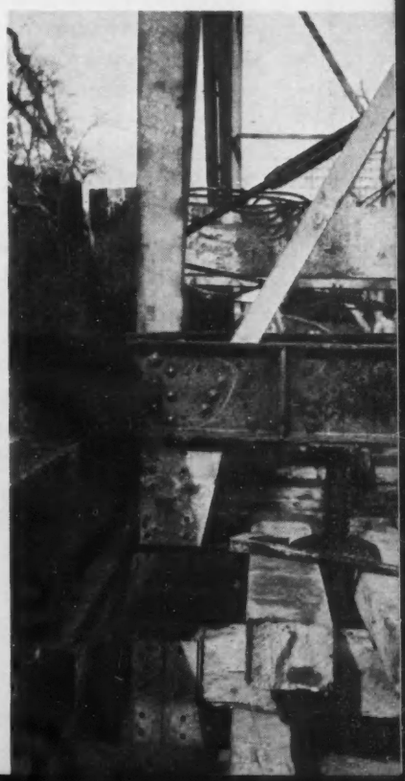
CONDUCTORS hung in stringing sheaves. Structure is for twelve circuits, with eleven positions occupied. Conductors were placed in stringing sheaves supported by insulator assemblies. Each sheave was tied down with another string of insulators to maintain rigidity of insulators and conductors while tower was in motion

TOWER being moved. Note rail arrangement, also transit on platform for checking distortion

To check distortion of the structure measurements were made to transverse marks on the tracks; transits were set on each longitudinal center line; plumb bobs were hung from the top of the structure and from the bottom of the bridge at each end; a transit was set up on a platform attached to and moving with the structure and was used to read scales set on the center line of the bridge. Four hours elapsed between the time the structure was jacked from its original footings until it was jacked down onto its new footings. Of this, actual moving time was one hour, while the remaining time was devoted to distortion checks. Greatest distortion observed during the 212 ft. of travel was less than 1 in.



TOWER being jacked on new footings. New footings had been set prior to moving, in order to expedite anchoring at the new location



Editorials

S. B. WILLIAMS, *Editor*

Where Do Draftees Stand After Training Period?

THE Selective Service Act, under which the draftees will shortly start their year of military training, has raised innumerable questions in the minds of our young men. These questions relate mostly to deferment and to employment status after the year of training. So far as the deferment is concerned, it is an individual matter between the draftee and the local board. There are no industrial occupations that are automatically deferred, although obviously defense material production is not going to be handicapped by the draft. In some instances the Army, with the help of industry, will draw up lists of jobs that might have a preferential rating, but these will be advisory only and not mandatory.

Upon the employee's status when he returns from his year of training the only thing required by law is that the man get the same or as good a job as he had when he left. Many of these men are in line for promotion to better jobs or in line for pay increases. Many have seniority rights. If these rights are to be recognized, what of the fellows who do the work during the men's absence. Are their promotions to be temporary, or what?

Many, if not most, employers have been quick to tell their employees what the company would do with respect to compensation adjustment, insurance, annuities and similar items. Of far greater importance is the matter of seniority rights and promotion. While it might not be possible to lay down hard and fast rules covering every situation, employers owe it to their young men to have a fair and understandable policy. Many a young man fears the draft not so much because of military training or a year of low income or even possible war as because of loss of position in the path of advancement. Without the assurance of no loss of opportunity we will find more boys striving to get out of service than we would otherwise.

Accurate Answers Needed on Industrial Power Survey

TO A LIST of 25,000 industrial plants, the names of which were supplied by utility companies, the Federal Power Commission is sending this week a short questionnaire designed to give data that will permit the forecasting of defense power loads sufficiently in advance to assure adequacy of electricity supply. On page 55 of this issue Chairman Olds of FPC explains in detail for the benefit of the power salesman the meaning of each question and the purpose back of the survey. This is a cooperative effort on the part of the commission and the utilities, the results of which can be very helpful to both if the questions are carefully answered.

There is a possible danger in the questionnaire which both sides would like to prevent, namely, pyramiding of anticipated demands. Because of all the talk of power shortages developing when defense production gets into full swing, there is the possibility that industrial customers will overestimate their future power requirements on the theory that if they ask for more than they will need they will have less difficulty getting their full requirements. Should there be any considerable amount of such overestimating the inevitable consequences would be disadvantageous to the utilities. On the other hand, should the estimates be insufficient, both the defense program and the utilities could easily be handicapped.

The power salesmen who know their customers' usage and operations have an opportunity in this connection to be of service to their customers, their company and their country by helping those 25,000 industrials to return to the FPC the most accurate survey of their requirements that is possible.

Net Building Load Building

THE SLOGAN this year for the load builders is "Selling for Net." The idea is by no means new; it is just that the emphasis is to be more pronounced, and rightly so because it is so timely. Already we have reached the situation where in certain instances sales are greater but the distributable net is smaller.

Slogans, however, are but the inspiration. Of themselves they will not do the trick. Before we can sell for net we must know what we get for added connected load as well as the cost to sell and to serve. There are some loads where the companies have a pretty good idea of the E.A.R., but there are others where the E.A.R. is guessed at. This is especially true with lighting.

How are we going to sell net if we do not first know the gross?

Likewise, too few companies know the cost to serve different loads. Perhaps in a highly diversified system this can never be known accurately. It would seem, however, if net were the object more should be known of the cost.

There are many loads which of themselves are

unprofitable, but which combined with other similarly unlucrative loads produce a good net.

However, do these relationships between loads remain unchanged? Are we not perhaps too prone in many cases to alibi certain loads on the basis of diversity? And equally prone to damn other loads for poor diversity?

Selling for net also presupposes a knowledge of the profitableness of the rate. There are some classes of business that carry too low a tariff and demand an upward revision.

There are numbers of customers with such low incremental rates that for added usage to show a profit it must be of a selective nature.

And then there are competitive loads. Selling for net presupposes that competition will not be met unless the load is profitable.

It will not be possible or even advisable to subject each new piece of business to the test of lucrativeness. Utility companies have an obligation to serve all loads. It should be possible, however, to put more of the effort behind the pay loads.

The point we wish to make is that while selling for net is imperative, it cannot be made effective as a sales policy until we first know what is profit load and the degree of its profitableness.

A Billion-Dollar Vision

THIS WEEK George A. Hughes was honored with the 1940 McGraw Award for Manufacturers. As the "father of the electric range," Mr. Hughes more than any one man has been responsible for the strong foothold which electric cooking has gained in this country.

When we learned that Mr. Hughes was to receive this year's award we wondered if there might be some financial accounting of what this man's vision has meant to the industry, not taking into account any of the customer benefits.

There are something over two-and-a-half million domestic electric ranges in service today and they will use this year about 2.3 billion kw.-hr. If we can assume an average of 2 cents per kilowatt-hour for electric cooking it will mean a gross revenue this year from ranges of $46,000,000.

Mr. Hughes produced the first commercially practical electric range in 1910. Assuming a growth considerably under a straight line from then until now, we estimate that in the thirty years the electric range load has brought to the utilities in the neighborhood of half a billion dollars.

The wiring of the ranges in service today has brought to the contractors and their suppliers another large market aggregating over the years around one hundred million dollars.

In addition there has come the sales of generating, transmission and distribution equipment to serve this growing range load.

If to these we add the sales value of the ranges of all manufacturers we have no trouble in arriving at a volume of business for all branches of the electrical industry well in excess of a billion dollars.

The industry is happy to honor the "father of the electric range" for his billion-dollar vision.

Integrated Assemblies for Engineering Students

ONE of the common doubts about the immediate usefulness of the engineering graduate is his ability to translate his academic knowledge of principles into the practicality of practical operation. Some technical schools favor a curriculum which emphasizes the basic principles, believing that the most versatile graduate is the one who can best adapt the fundamentals to any specialized branch of practice. At the other extreme is the trade school, which familiarizes the student with the prevailing forms of commercial equipment, and teaches him how they function, how they are controlled and repaired. Both these schools find their supporters among employers, many of whom prefer the well-grounded theorist with a capacity for adaptability, while others ask for a greater measure of familiarity with the forms of current practice.

The happy medium for a large fraction of the engineering employables would seem to be a technical course which aims to integrate the fundamentals into a composite pattern which, at least, reflects the way in which things go together in the workaday world.

Take transmission, for example. Could there be any great harm or sacrifice of rigor if the students in the laboratory should have a miniature of a transmission system placed before them with commercial forms of protective equipment and means for simulating lightning and faults and voltage corrective functions? Might they not acquire a better understanding of the job assigned to the ground wire, the counterpoise, the breakers and relays, the tap-changers and synchronous condensers if they could observe them in practical assembly? Also, would they not better grasp the value in digging into theory of disruptive discharges, of magnetic induction, of power-factor correction, of stability and of excitation if they saw the disease before they saw the remedy or even heard of the symptoms?

Professors, particularly those in areas remote from metropolitan centers, find it a problem to keep abreast of current developments in the field of practice. As a result they are prone to preserve the emphasis of a prior era on phenomena that have been relegated to a position of lessened importance. Many too are fearful of making their courses too "practical" at the expense of basic education. By looking into the possibilities of approaching practical engineering from the angle of integrated assemblies they could devise courses which would better bridge the gap between theory and practice than many courses now given.

St. Lawrence Power

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

IT LOOKS as though President Roosevelt is going to get his way on St. Lawrence power. Also that the Canadian government will get precisely what it wants—more power from Niagara—and quickly. The seaway portion of the project is still on the lap of the gods.

A "battalion of death" in the Senate, consisting of Atlantic and Gulf Coast states members, is determined there shall be no seaway. Most of them care very little about the power angle, one way or the other. They are interested only in preventing a move which would transfer railroad and port business from their states.

How strongly Mr. Roosevelt will fight for the seaway, once he gets his power project under way, is a pure guess. He has never been really interested in the seaway except as an excuse to go ahead with the electric development. Once having got what he wants, he may or may not care to risk a knockdown and dragout fight with such a determined group in the Senate. This is especially true because some of these senators are his very warm supporters on all other policies.

Without Treaty

Mr. Roosevelt short-circuited the opposition, so far as the electric project is concerned, by the simple expedient of going ahead without the ratification of a treaty with Canada. By doing this he humbled a great many Washington observers, including this writer, who have been predicting that there could never be a St. Lawrence seaway project because it would always be impossible to get the two-thirds majority necessary in the Senate to approve a treaty.

If Mr. Roosevelt now fights for the seaway—without the formality of a treaty—he will have to win only a majority of the Senate, for the question will come on additional appropriations. He will also have to win a majority of the House for the same purpose.

In this respect the St. Lawrence now lines up, technically, with Passamaquoddy and the Florida Ship Canal. Both of these were started by the President with funds from his blanket appropriations, without Congress having ever approved them specifically. Discontinuance of both of them by the President remains a mystery. He could have continued them without asking the approval of Congress. He had plenty of funds. But he chose to force Congress to take the responsibility by voting specific appropriations for their continuance, and Congress balked.

That may be the future of the St. Lawrence seaway. The President has started it with blanket funds placed at his disposal by Congress presumably for defense purposes. The only real defense angle is that Canada should get more power at once for her factories. Canada will get that. But of course the money being spent by the President was not necessary for this. The spending is aimed at power some time in the future, probably not until the present war is over.

Canada wanted this additional power some time back—before the present war started. At that time Washington told her the whole boundary water question was in one piece —must be settled in one treaty. Canada now gets what she asked for then (as this writer predicted in ELECTRICAL WORLD that she would) but without a treaty.

What will happen if the President ever asks Congress specifically for an appropriation to continue the power development on the St. Lawrence depends on a great many factors unknown as this is written. But there is less doubt as to what the Canadian attitude will be.

With the coming of peace Canada will face a driving need to curtail government expenditures. She will have the additional power she wanted from Niagara. Whether the need to find employment for returning soldiers will overbalance the need for economy is the uncertain element, but the one on which public power advocates in Washington are counting.

But come what may, the opposition to the seaway will continue on Capitol Hill. There is no possible way of softening it. Nor is it confined to the Atlantic and Gulf Coast states. For instance, there is by no means the unanimity for the seaway that once seemed to exist in the Great Lakes states. One of the great newspapers in Chicago is ardently in favor of the seaway, another regards it an absurd waste of money.

Liverpool Price

Back in the days when the agitation for a seaway first started the argument which made the most headway in the Middle and Northwestern states was that it would increase the price to the farmer of every bushel of wheat produced in that entire region about 6 cents. The point was that the world price of wheat was determined in Liverpool. The price anywhere else was the Liverpool price less freight to Liverpool. So if the freight to Liverpool could be cut 6 cents by a St. Lawrence seaway, as contrasted with a rail haul to the Atlantic ports, the farmer would get 6 cents more for each bushel he sold. So every candidate for president from 1920 on came out definitely for the seaway construction.

But the picture has changed, a little. We are not exporting so much wheat as we were. What will happen after the war? Nobody knows, but it is quite possible that we will be giving food to Europe. No one seems to think they will be able to pay for much of it.

So maybe the Liverpool price will not be important!

Only one thing is certain. That is that if and when a battle comes in Congress over an appropriation for the St. Lawrence it is likely to rise to the heights attained by Wilson's fight with the Senate over the League of Nations and Roosevelt's over packing the Supreme Court.

NEWS OF THE WEEK

Cincinnati Utility Starts Work on New Addition

Plant expansion program of Cincinnati Gas & Electric calls for installation of 65,000-kw. turbo-generator and two new boilers—Company recently completed $15,000,000 program

A plant expansion program calling for the installation of a new 65,000-kw. General Electric hydrogen-cooled turbo-generator and two new 35,000-lb.-per-hour boilers at the Columbia Park station is to be undertaken by Cincinnati Gas & Electric Co. The plant expansion program is to cost between $6,000,000 and $7,000,000 and will be completed in 1942.

The new unit will operate on steam at a pressure of 650 lb. and 900 deg. total temperature and will be a duplicate of the unit which went into operation at the Columbia station last year. Extensions to the boiler and turbine rooms will be necessary to house the new equipment as well as certain lines to connect the new capacity with the rest of the system.

Announcement of the new project follows completion of a $15,000,000 program which saw the addition of 100,000 kw. of new generating capacity at Columbia Park and West End stations and the flood-proofing of these plants.

In addition to the work at Columbia station a major transmission interconnection involving erection of a new 132-kv. steel tower line between the Cincinnati Gas & Electric Company's Trenton substation and the Muncie, Ind., plant of the Indiana General Service Co. is under construction, which was begun last spring and which will be in service by the end of the year. The 25-mile section of this line from Trenton substation to the Indiana state line is being built by the Cincinnati company and involves the expenditure of about $500,000. New transformers and other equipment are being installed at the company's Trenton substation to serve the new line at a cost of additional $500,000. The initial capacity of the interconnection will be 50,000 kw.

When completed there will be 129 towers in the 25-mile section of the new line being built by the Cincinnati company. Towers will have an average spacing of 1,000 ft. and range in height from 100 to 135 ft. Tower bases at the ground are from 22 to 32 ft. square. The single-circuit now being erected consists of three 397,500-circ.mil A.C.S.R. conductors. A ten-disk string of suspension insulators supports the conductors on straight line towers and a double string of twelve units each on dead-end and angle structures. An overhead ground wire of 159,000-circ.-mil A.C.S.R. conductor shields the line from lightning.

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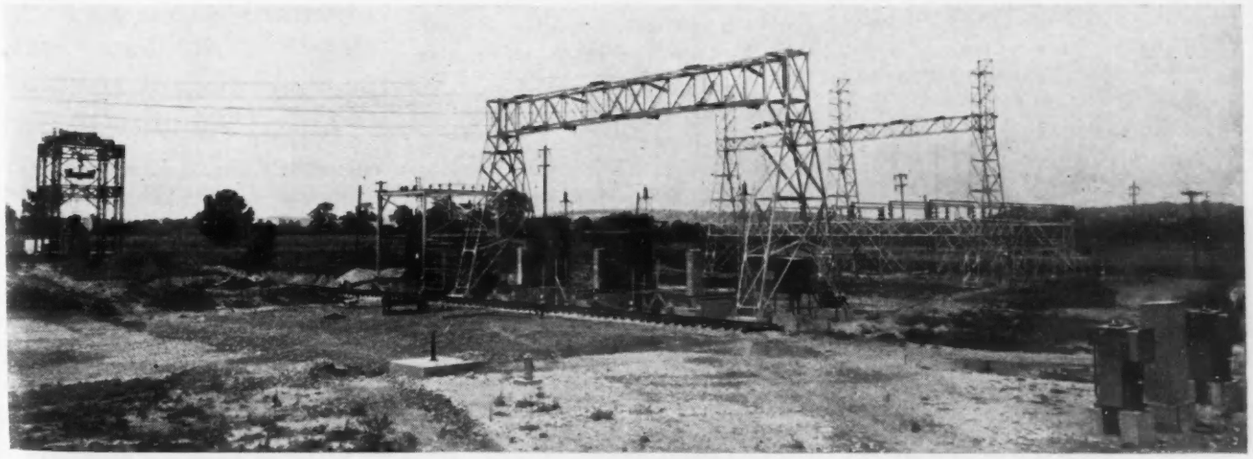
Offers Funds for Research

An offer of $25,000 a year for a period of five or ten years for the establishment of a scientific research bu-



INTERCONNECTING POINT—Trenton substation of Cincinnati Gas & Electric Co., which will be the interconnecting point where power from the Cincinnati system will be interchanged with that from the Indiana General Service Co. over a new 132-kv. transmission line. Take-off tower is shown in the background

reau in the state has been made by Thomas W. Martin, president of Alabama Power Co. Mr. Martin told the Alabama State Chamber of Commerce that the only stipulation is that another company or companies put up a like amount in order further to develop the natural resources of Alabama and the South.

•

Order 80,000-Kw. Unit for Buffalo Station

Buffalo Niagara Electric Corp., a subsidiary of the Niagara Hudson Power Corp., will add 80,000 kw. of generating capacity to its Charles R. Huntley steam station at Buffalo at a cost of approximately $6,000,000, Col. William Kelly, vice-president, has announced. The Huntley station now has a capacity of 465,000 kw.

The order for the building of the 60-cycle steam-driven turbine-generator has been given to the General Electric Co. Construction of the unit will take about seventeen months and in the meantime work will begin on the building which will house the new generator. The unit is expected to be ready to deliver power within two years.

In announcing the purchase of the new generator Colonel Kelly said the company was increasing the capacity of the Huntley station to take care of an expected rise in demand. The work, he said, is evidence of "our confidence in the future development of this section of New York State."

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Upholds City Referendum

In a unanimous decision handed down recently the state Supreme Court upheld the legality of a May, 1935, referendum voted by the city of Medford, Wis., to acquire the local electric plant of the Lake Superior District Power Co. The power company had appealed to the high court from a decision of Circuit Judge A. C. Hoppmann, entered last December, upholding a decision of the state Public Service Commission, which approved the 1935 referendum.

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Hopson Must Stand Trial

Howard C. Hopson, Associated Gas & Electric system executive, is neither physically nor mentally unfit to stand trial under an indictment alleging mail fraud and conspiracy, Federal Judge Alfred C. Coxe ruled this week. Trial date was set for November 6.

NEWS BRIEFS

MANAGER J. D. LEWIS of Pullman, Washington Water Power Co., donned this medal-bedecked uniform to lead his military staff in the recent range sales campaign. He toured his territory with his range girls' patrol to pep up salesmen to put over the drive. A summer slump turned into a major sales boom with 2,044 ranges sold by company and dealer during the three months.

STARTING THIS WEEK New York Consolidated Edison and co-operating dealers are launching a three-month sales drive on a G. E. sunlamp complete with electric timer at a considerable reduction from the regular price. Term financing is arranged.

IN A NOVEL two-week 1-cent lamp sale Buffalo Niagara Electric Corp. sold 135 combination lamp sets at an average of $13.50 a set. The combination consisted of an I.E.S. lamp, from $9.95 up, and a "wallamp," which was offered for 1 cent.

JACKSONVILLE, FLA., City Commission has decided not to enter into an interconnection agreement with Florida Power & Light or any other private utility to supply power to national defense projects in the service area of the municipal system. Chairman Leland Olds of FPC wanted the interconnection to insure against possible interruption. Jacksonville said its plant is able to meet the load.

CREDITORS of the late Samuel Insull, who once controlled a billion-dollar utility system, will receive from his estate about 0.001 cent on the dollar on their claims totaling $4,114,000. The estate totaled $9,091.

CHARLES H. GRIFFITH, formerly manager of the Hotpoint distributing branch at Buffalo, is now manager of the kitchen sales division with headquarters in Chicago.

EMPLOYEES of South Carolina Power Co. are donating money to buy a mobile feeding unit for the relief of British war sufferers. Complete traveling kitchens, built on light truck chassis, are available with insulated food containers for soup, stew and coffee. These are dispatched into bombed areas and can feed 400 people at a time. Price is $1,060.

OPPOSITION to the "confiscatory" policy of erecting public power distribution facilities that parallel existing lines of private utilities has been expressed by the California State Water Project Authority.

CHAIRMAN THOMAS H. HOGG of the Ontario Hydro-Electric Power Commission states that the commission is considering the erection of a 50,000-hp. addition to its Welland Canal plant at DeCew Falls to cost $4,000,000 to $5,000,000.

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Seeks Court Ruling on PUD Question

A fundamental question whether a public utility district, under existing laws and court decisions has a right to condemn private utility property will be decided when a decision is reached on the appeal of Puget Sound Power & Light Co. from a federal court decision which fixed $5,000,000 as the price Whatcom County PUD should pay in condemnation proceedings.

Frank McLaughlin, utility president, said that "if the company's contentions are confirmed by the Circuit Court of Appeals it will put a stop to the uneconomic and costly piecemeal condemnation program of some of the public utility districts."

Belief was expressed by Mr. McLaughlin that private operation best serves the public interest. However, he said, this is a question the people must decide in the light of present conditions. He thought that the question should be decided by public vote.

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Cooking Council Names Essay Contest Winners

Frank L. Richards, Consumers Power Co., Grand Rapids, Mich., won first prize, $100, in the national essay contest conducted by the Commercial Electric Cooking Council. The subject of the papers entered in the contest was: "How My Customers Profit from the Use of Electric Counter Cooking Equipment." Seventy-four papers were submitted.

Nine other prize winners included: G. E. Schraudt, Jr., Florida Power Corp., $50; Joseph Noser, Union Electric Co., $25; H. M. Kemmer, Appalachian Electric Power Co., $15; T. J.

James, Ohio Edison Co.; W. G. Seck, Ohio Public Service Co.; C. C. Jordan, Carolina Power & Light Co.; O. B. Moore, Carolina Power & Light Co.; R. H. Walker, Pennsylvania Power & Light Co.; W. Wallace Burke, Public Service Co. of New Hampshire, all $10.

Judges were Philip S. Salisbury, *Sales Management Magazine;* Henry G. Dooley, ELECTRICAL WORLD, and Davis M. DeBard, Stone & Webster Service Corp.

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High Point Project License Vacated

In view of the decision of the Supreme Court of North Carolina that the city of High Point is not authorized by state law to comply with or accept the terms of a license issued under the Federal Power Act, the Federal Power Commission has vacated its order, adopted March 10, 1939, authorizing the issuance of a license to that city for a major power project to be constructed on the Yadkin River.

This action by the commission was taken upon an application filed October 17 by the city of High Point for vacation of the commission's order authorizing the issuance of a license for a project to be located near Styers Ferry on the Yadkin River, North Carolina, and upon surrender of the license therefor.

The commission decided that, in view of the decision of the Supreme Court and the subsequent action of the City Council in repealing its resolution of acceptance and in surrendering the license, it would be appropriate to vacate the order which originally authorized the issuance of a license to the city.

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Bonneville Signs Contract With Aluminum Company

Bonneville Administration has signed a 20-year contract with Aluminum Co. of America for 97,500 kw. of power for three additional alumina reduction units to be added to the company's new plant, recently opened. The contract is the standard Bonneville contract, at $17.50 per kilowatt-year.

A cancellation clause permits Aluminum Co. to terminate the power purchase upon two years' notice after the first year upon payment of a penalty amounting to the unamortized out-of-pocket cost for facilities. The power will be made available in three installments, April, May and June of next year, part of it probably coming from Grand Coulee.

Dresser Addition Nears 75 per Cent Completion

Four-million-dollar project started last November includes new 50,000-kw. turbo-generator — Company to start erection of steel work for 50,000-kva. outdoor substation

Construction of the new 50,000-kw. addition to Dresser generating station near Terre Haute, Ind., is approximately 75 per cent completed, it is announced by G. J. Oglebay, vice-president of Public Service Co. of Indiana.

Started last November, the $4,000,000 project will boost the capacity of the plant to 125,000 kw. when the new generator set goes into service some time next spring. Dresser supplies power to a large section of the company's territory in central and southern Indiana.

Dry Weather Helps

Favored by several months of unusually dry weather, the contractor has been making rapid progress on all operations. Although delivery of the turbo-generator unit, which is being built by the General Electric Co., will be somewhat delayed due to emergency orders for the government's national defense program, all other work on the project is moving along right on schedule, according to Mr. Oglebay.

The extension on the north side of the present plant structure which will house the new generator and boiler equipment has already been closed in and the foundations prepared for the turbine, generator and steam condenser. Installation of auxiliary equipment, including circulating pumps, etc., and condenser tubes is under way.

The big 400-ton coal bunkers were completed several weeks ago and the two new boilers, each rising to a height of eight stories and capable of producing 250,000 lb. of steam per hour at 650 lb. pressure and 900 deg. F. temperature, are about to receive the finishing touches. The engineers expect to start making cold water boiler tests within the next three or four weeks.

With the expected arrival this week of several carloads of structural steel work will get under way promptly on the new 50,000-kva. outdoor substation, which is designed to step up the generator voltage of 13,800 to 132,000 volts for transmission over high-tension lines radiating in several directions from the plant. A number of 5,000-kva. transformers to be installed in the substation are now on hand.

In charge of the construction project for Public Service Co. are its electric superintendent, J. J. Trainor, and Charles D. Perrine, supervising engineer, both of Indianapolis.

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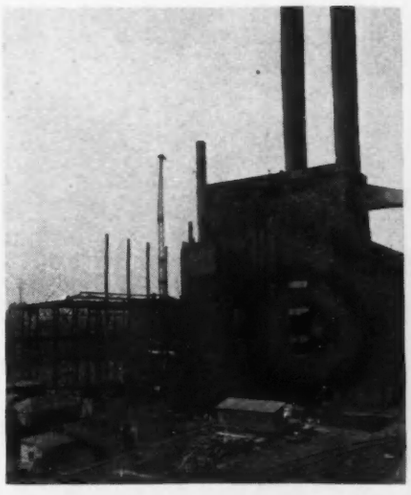
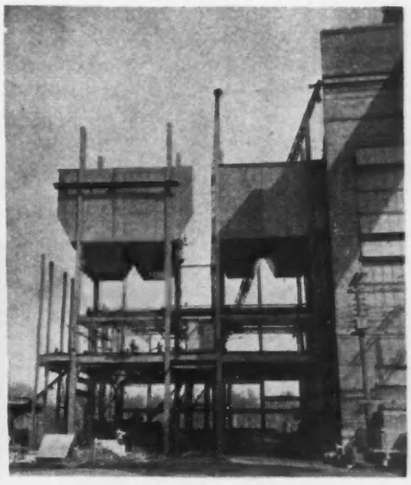
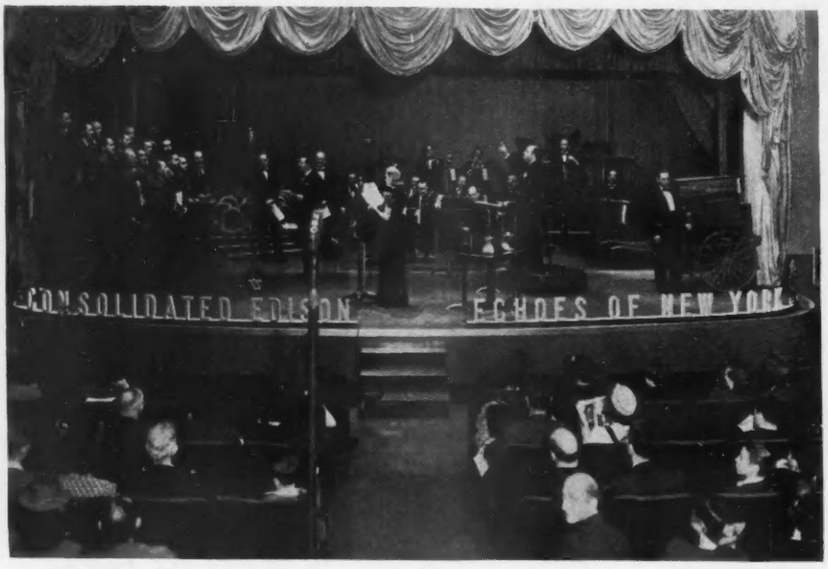
Canadian Output Dips

Output of Canadian central electric stations in September totaled 2,399,678,000 kw.-hr., compared with 2,500,179,000 kw.-hr. in August and 2,380,652,000 in September, 1939, Dominion Bureau of Statistics reports.





CONSTRUCTION OF DRESSER ADDITION—A 50,000-kw. G.E. turbine will go into new addition (left) to Public Service Co. of Indiana's Dresser generating station. Boiler room structure (at right) is to provide for 400-ton bunkers supplying two 250,000-lb boilers



ON THE AIR—Consolidated Edison Co. of New York has started its sixth successive season with its radio show "Echoes of New York" in a half-hour topical revue, broadcast over WJZ on Wednesday evenings. The show is produced under the supervision of Clarence L. Law, vice-president

Bonneville Gets Two New Power Prospects

Bonneville Administration's announcement it had two new live prospects for industrial power—Swiss Aluminium Co. and Reynolds Metal Co.—this week led to a fresh capitulation of the demand for Bonneville power which has manifested itself in contracts.

Bonneville's power goes to industrials, to public agencies and to private utilities, and to serve these customers the plant has 86,400 kw. installed now, will have 194,400 kw. in January, 1941, and 302,400 kw. in December, 1941.

Industrial contracts so far total 73,000 kw., but less than half of this is in effect this year. Aluminum Company of America's $4,500,000 plant is going into production now, starting with 27,000 kw., which will be increased in 500-kw.-per-month increments until 32,500 kw. is reached, and a second 32,500-kw. contract, on a five-year basis, will take effect with the same firm when the initial enlargement of Bonneville capacity becomes serviceable next January.

The two other industrials which have signed contracts are Sierra Iron Co., for 3,000 kw. now, 6,000 kw. in June, 1941, and the Pacific Carbide & Alloys Co., for 2,000 kw. beginning next month.

Public agencies have contracted for 12,850 kw., but only 1,450 kw. is being sold now. The contracting agencies include five public utility districts for a total of 5,600 kw., sixteen municipals for a total of 6,400 kw., and one REA project, now taking 300 kw. The cities of Seattle and Tacoma have exchange contracts for dump power if and as needed.

Principal private contract is that with Portland General Electric Co., for 20,000 kw. This expires in November, but negotiations looking toward extension are under way now. Actually, the utility has taken up to 63,000 kw., the excess on a dump basis, and bills have run as high as $78,000 per month. Pacific Power & Light Co. has a contract for 1,500 kw.

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New Tax Burden

The excess profits tax measure which has been passed by Congress will increase the normal levy from 18 per cent to 24 per cent. This will increase the normal taxes of utilities by one-third and add considerably to the burden. From the standpoint of excess profits, the utilities are not likely to be greatly affected, since the rate of return is controlled by regulatory authorities.

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Dismisses Rate Charges

Illinois Commerce Commission has dismissed the attack of eight men on rates of the Commonwealth Edison Co. for electric service in Chicago. In dismissing the case the commission stated that no reasonable cause has been shown by the complainants for institution of a rate case involving the rates of the company, which if launched would have been at the ultimate expense of the public and the ratepayers.

Group Advocates Use of Socket Type Meter

Representatives of a state-wide organization, the Municipal Electric Utilities Association, last week appeared before the New York Public Service Commission in support of the new type watt-hour meter which they said in their experience has proved superior to other types.

The meter under discussion, during the hearing on the petition of the village of Westfield, is the so-called "socket" type which is said to make possible lower operating costs and electric rates. Its backers claim it can be tested more easily than the old, more bulky kind.

H. P. Sparks, Westinghouse Electric & Manufacturing Co. sales manager, was the principal witness. Counsel for the commission attempted to show in cross-examination that the old type meter is just as advantageous as the socket type in many respects. Mr. Sparks reasserted his belief that the socket type which Westfield wishes to use is much better. He said that it is less vulnerable to tampering and that it can be tested much more easily. The "S" type is also safer, he said, although readily admitting that a man testing it could get a shock.

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FPC Cites Puget Sound Co.

Federal Power Commission has directed the Puget Sound Power & Light Co. to show cause, at a public hearing set for November 12, why proceedings should not be instituted against the company and its officials for failure to comply with the commission's Uniform System of Accounts and specific orders of the commission relating to such compliance.

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Private Utility Proposes to Build REA Project

Construction and operation of the proposed REA project in the Sandria Mountains and the Estancia Valley will be done by private utilities instead of the Sandia Electric Co-operative.

Under an agreement, to be formally drawn up, the Stonewall Electric Co. will apply for a REA loan and will construct the power lines. It then will lease the lines to the Albuquerque Gas & Electric Co., which will supply current. Both companies are subsidiaries of Federal Light & Traction Co. The Stonewall company was organized to construct REA projects and has them in Arizona, Colorado and Wyoming.

New 140-Kv. Link for Consumers Power

Expansion of generating capacity at Consumers Power Co. has led to authorization of a new 114-kv. line from Lansing to Flint and enlarged substation facilities, according to Dan E. Karn, vice-president and general manager of the utility.

"Within the last eleven months," he explained, "we have opened two large new generating plants, the Bryce E. Morrow plant at Comstock and the John C. Weadock plant at Essexville. Additional turbo-generators are now being manufactured for installation in these plants.

"Naturally the additional generating capacity calls for additional transmission facilities. A second high-voltage line from Lansing to Flint is especially important because of the increase in the use of industrial power in the Flint area. The new line will provide additional transmission capacity and make possible the transfer of large blocks of power from one part of the state to another as load conditions demand."

Between Flint and Lansing power flows in either direction, north from generating plants at Battle Creek, Comstock and Kalamazoo, or south from plants along the Saginaw and Au Sable rivers. Also tied into the interconnected system are a large Grand Rapids plant and several hydro-electric plants on the Muskegon and Manistee rivers.

From the Garfield avenue substation in Flint the new line will run about 11 miles to the Hemphill substation, also in Flint, and thence south 16 miles. These portions of the line will be carried on new four-legged steel towers. Then the line will run west about 36 miles on H-frame wooden-pole construction to a point near US-16 between Okemos and Williamston. From this point it will be carried on existing steel towers to the Delhi substation south of Lansing. Conductor wires will be of aluminum reinforced with steel.

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A. I. E. E. Talks of Utilities and War

In the event of war, whatever they are called upon to do, the public utilities will not fail in their obligations to the communities they serve, H. C. Forbes, system engineer, Consolidated Edison Co. of New York, Inc., told the power group of the New York section of the American Institute of Electrical Engineers last week.

Any discussion of how war would affect the public utilities hinges on the type of war meant, Mr. Forbes pointed out, adding that a total black-out in New York might reduce Consolidated Edison's peak load by as much as 15 per cent. In commenting on the effect of the war on the British utilities, Mr. Forbes said it appears fortunate that the grid has not been carried to completion.

Following Mr. Forbes' talk, a group of experts, including C. E. Shaw, manager of industrial relations, Standard Oil Company of New Jersey; D. S. Sargent, assistant personnel director, Consolidated Edison Co. of New York, Inc.; H. S. Bennion, vice-president and managing director, Edison Electric Institute, and Col. T. D. Weaver, U. S. Army, Corps of Engineers, interpreted the provisions of the Selective Service Act as they will affect the electrical engineering and utility industries.

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Start Power Development

Work will start immediately on the Madawaska power development at a cost of $7,000,000. Dr. T. H. Hogg, chairman of the Ontario Hydro-Electric Power Commission, announced at Kingston, Ont. The Madawaska development is on the Madawaska River, a tributary of the Ottawa River, and the power plant is to be located about 20 miles west of the Ottawa in the Calabogie Lake district. The plant will cost $5,500,000 and there will be an additional expenditure of $1,500,000 for a storage plant at Dark Lake. Madawaska will develop 54,000 hp.

U. S., Canada Appoint St. Lawrence Boards

A four-man Canadian temporary Great Lakes-St. Lawrence basin committee, to work with members of a similar United States committee on early development of power resources in the International Rapids, has been named.

Members of the Canadian committee include Guy A. Lindsay of Ottawa, engineer in charge of general engineering, department of transport, chairman; Thomas H. Hogg of Toronto, chairman and chief engineer, Hydro-Electric Power Commission of Ontario; Oliver Lefebvre of Montreal, member of the Quebec Electricity Board, and J. E. Read of Ottawa, legal adviser, department of external affairs.

Members of the United States committee includes Leland Olds, chairman of Federal Power Commission, chairman; A. A. Berle, Assistant Secretary of State; Brig. Gen. Thomas M. Robins of Board of Engineers for Rivers and Harbors, U. S. Corps of Engineers, and Gerald V. Cruise, representative of the trustees of the Power Authority of the State of New York.

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Lets Lighting Contract

Memphis Light, Gas and Water Division Commission has awarded an $87,740 contract to the Shelby Electric Co., Memphis, for furnishing new ornamental street-lighting standards for the Main Street area.

ADEQUATE WIRING—More than 13,000 people filed through this particular home in Hartford, Conn., one of "Homes for All Parade." More than 75,000 inspected the eight adequately wired homes sponsored jointly by Hartford Electric Light Co., Hartford *Times* and furniture and department stores

E.E.I. Group Tells of Safety Practices

Decreases in lost-time accidents, days lost and fatalities were shown in the first eight months of 1940 by the member companies represented on the accident prevention committee of the Edison Electric Institute, J. E. Goodale, Consolidated Edison Company of New York, Inc., reported at the two-day session of this group last week in New York.

For the 20 companies, employing more than 85,000 men, accident experience for the first eight months (converted to an annual basis) showed a reduction in lost-time accidents per 100 men from 2.20 to 2.10. Days lost per 100 men dropped from 53 to 42.2 and fatalities per 1,000 men decreased from 0.49 to 0.39.

Reporting cause and location data for the years 1938 and 1939, Mr. Goodale added that reports covering 156,000 man-years for 28 companies indicated that 55 per cent of the fatalities were due to employee practices. Overhead lines were charged with 63 per cent, or 60, of the fatalities in this two-year period. Generation and switching and substations were the next locations in percentage of fatalities, with 10 per cent each.

Edward C. Rue, Boston Edison Co., showed the committee the lightweight, low-voltage rubber gloves being issued to the servicemen of his utility for use on secondary service only. Discussion among the committee showed increased interest and use of some form of lightweight glove for this purpose.

W. R. Smith, Public Service Electric & Gas Co., chairman of the accident prevention committee, told of various protective features in use by his company. These included a rubber blanket covering secondaries, a bolt head protector of insulating material to cover a transformer mounting bolt where it extends through the pole on the side opposite the transformer, and a safety booklet "Welcome," explaining both employer and employee phases of the problem, distributed to workmen on the new Burlington plant addition. George S. Diehl reported that voluntary swimming courses under trained instructors for workers at the utility's hydro plant had proved a worth-while undertaking.

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Gets Adequate Wiring

The Adequate Wiring Bureau of Akron district has made something of a record in certifying the wiring in a three room house which cost approximately $1,000. In this small house there are five ceiling outlets, three wall outlets, nine switches and ten convenience outlets. There is one 20-ampere appliance circuit and two 15-ampere lighting circuits and a range circuit.

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N.E.M.A. New Pamphlet

The National Electrical Manufacturers Association has published an analysis of the 1940 revision of the National Electrical Code. The analysis describes all changes from the 1937 edition. Copies can be obtained from headquarters at 155 East 44th Street, New York City.

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Mayor Vetoes Dividend

A 20 per cent dividend to consumers of electricity sold by the municipal electric plant at Jamestown, N. Y., in the year ended September 30 was denied recently under veto action taken by Mayor Leon P. Roberts. Corporation Counsel Samuel C. Alessi explained that the board could not act on the Mayor's veto until its next regular meeting on November 19 and pointed out that the dividend was set for November 1. In acting on the dividend plan the board turned down a proposal by Mayor Roberts for an outright $150,000 donation to the city.

MEETINGS

Wisconsin Utilities Association—Annual Convention, electric section, commercial and technical divisions, Hotel Pfister, Milwaukee, November 11-12. A. F. Herwig, executive secretary, 135 West Wells St., Milwaukee, Wis.

Chicago Lighting Institute—Second fluorescent lighting sales conference, Institute headquarters, 20 North Wacker Drive, Chicago, November 11-13.

Adequate Wiring Conference—Sponsored by the National Adequate Wiring Bureau and the International Association of Electrical Leagues, Palmer House, Chicago, November 12.

International Association of Electrical Leagues—Annual conference, Palmer House, Chicago, November 13-14. O. C. Small, secretary, 155 East 44th St., New York, N. Y.

Illinois Public Utilities Association—General meeting, Hotel Pere Marquette, Peoria, Ill., November 14-15. Jack Abbey, secretary, 935 Illinois Bldg., Springfield, Ill.

Southeastern Electric Exchange—Fall sales conference, Henry Grady Hotel, Atlanta, Ga., November 14-16. J. W. Talley, executive secretary, 303 Haas-Howell Building, Atlanta, Ga.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., December 2-5. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

American Society of Agricultural Engineers—Fall meeting, Chicago, Ill., December 2-6.

National Exposition of Power and Mechanical Engineering—Grand Central Palace, New York, N. Y., December 2-7.

National Association of Railroad and Utilities Commissioners—Annual convention, Hotel Miami-Biltmore, Miami, Fla., December 10-12. Clyde S. Bailey, secretary, New Post Office Bldg., Washington, D. C.

National Chemical Exposition—Sponsored by Chicago Section, American Chemical Society, Stevens Hotel, Chicago, December 11-15.

American Institute of Electrical Engineers—Winter convention, Philadelphia, Pa., January 27-31. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Welding Practices Told at Annual Meet

Electric arc welding appears to be a superior method of jointing carbon-molybdenum piping for high-temperature, high-pressure service, R. W. Emerson, Pittsburgh Piping & Equipment Co., told the American Welding Society at its annual meeting last week in Cleveland, Ohio.

Speaking at one of the technical sessions which featured the meeting, Mr. Emerson pointed out that power plant materials and their fabrication must pass rigid specifications and inspection today, as a result in increase of power plant piping service requirements from 200 lb., 500 deg. F. in 1915 to as high as 1,800 lb., 950 deg. F.

At another session J. H. Cooper, welding engineer, Taylor-Winfield Corp., saw resistance flash welding of steel strip becoming more and more a necessity as competitive pressure in steel production increases. He placed electrical power requirements as approximately 25 kva. per sq.in. of welded cross-section during the flashing operation, adding that this figure is about one-fourth of the equipment nameplate rating per square inch of welded maximum section. He pointed out, however, that the nameplate rating is merely indicative as a means of standardizing equipment and has no direct connection with the power demand during weld.

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Utility Files Preferred Issues with Commission

Central Kansas Power Co., Abilene, Kan., has filed an application and declaration with the SEC regarding the issuance and sale of 5,821 shares of 4¾ per cent cumulative preferred stock, $100 par value, to an underwriting group at a price of $97 a share.

The underwriters propose to offer the new preferred stock to holders of the company's outstanding 7 per cent and 6 per cent preferred stocks residing in the state of Kansas on a share-for-share basis. Shares not taken under the exchange offer will be offered to residents of that state at a price of $100 a share.

Proceeds from the sale of the new preferred stock, together with other funds of the company, will be used to redeem on November 15 the outstanding 7 per cent and 6 per cent preferred stocks at $100 a share.

The company also proposes to issue, after reclassification, 30,000 shares of common stock, $9 par value, in exchange for its 3,000 shares of common stock, no-par value, presently outstanding.

Energy Production Continues to Rise

Continuing in the upward movement that began in the week ended October 5 and has persisted through the month, production of electricity in the week ended October 26 rose to 2,711,282,000 kw.-hr., according to the Edison Electric Institute.

Output in the most recent week was 6.8 per cent ahead of the corresponding week a year ago; this margin was slightly less than in the previous week. The advance over 1938 amounted to 21.8 per cent and over 1937 to 20.2 per cent, the latter gain being the largest percentage increase for any week this year.

For the week ended October 26 energy production was 2.7 per cent ahead of last winter's peak; corresponding increases for 1939 and 1938 were 7.4 and 1.1 per cent, respectively.

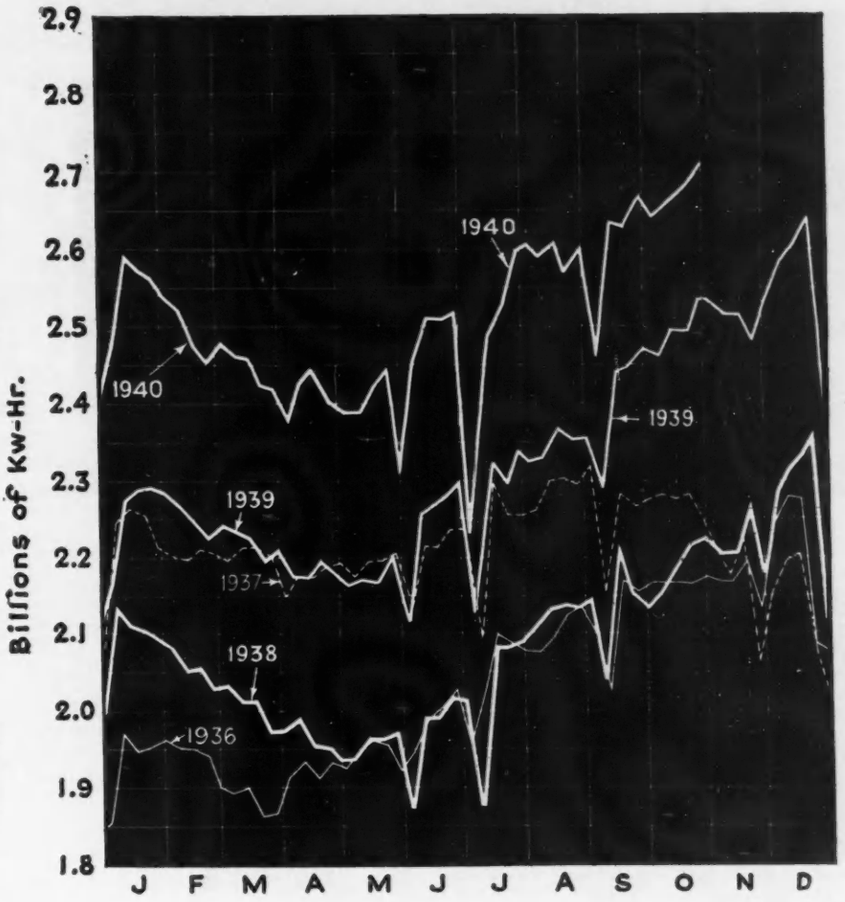
Among major geographic regions, the lowered gain over 1939 in the Central Industrial region in the week ended October 26 was the most noticeable change, this percentage dropping from 10.6 to 9.2 per cent. In four of the country's sections the margin over 1939 was higher in the most recent week than in the preceding week, but these increases amounted only to fractions of a per cent.

Weekly Output, Millions Kw.Hr.

1940		1939		1937	
Oct. 26	2,711	Oct. 28	2,539	Oct. 30	2,255
Oct. 19	2,687	Oct. 21	2,494	Oct. 23	2,282
Oct. 12	2,665	Oct. 14	2,495	Oct. 16	2,276
Oct. 5	2,641	Oct. 7	2,465	Oct. 9	2,280
Sept. 28	2,670	Sept. 30	2,470	Oct. 2	2,276
Sept. 21	2,629	Sept. 23	2,449	Sept. 25	2,266
Sept. 14	2,639	Sept. 16	2,444	Sept. 18	2,281

Per Cent Change from Previous Year

	Week Ending		
	Oct. 26	Oct. 19	Oct. 12
New England	+ 3.7	+ 3.5	+ 6.2
Middle Atlantic	+ 5.6	+ 5.8	+ 5.0
Central Industrial	+ 9.2	+10.6	+ 8.9
West Central	+ 5.4	+ 5.0	+ 3.9
Southern States	+ 6.9	+ 7.6	+ 5.2
Rocky Mountain	+ 0.4	+ 0.1	+ 1.6
Pacific	+ 7.2	+ 7.0	+ 7.2
United States	+ 6.8	+ 7.7	+ 6.8



Kentucky Co-operatives Refuse to Pay Taxes

Refusal to pay taxes assessed by Commissioner of Revenue H. Clyde Reeves against the 20 rural electric co-operatives in the state was announced recently by the Kentucky Association of Rural Electrification Administration Directors.

In a letter to Gov. Keen Johnson the directors said they had voted unanimously not to bring suit to test the constitutionality of paragraph 27 of the state REA Act, which exempts the non-profit co-operatives from the property tax, and announced that "these co-operatives will not pay such tax."

Mr. Reeves said that whether or not the state can tax the co-operatives is a question that ought to be settled definitely for the mutual benefit of both parties. "As a matter of public policy," Mr. Reeves stated, "the question ought to be settled. What this administration does is not binding on some future administration. If we don't tax the co-ops, some future administration might. It is not fair to the farmers for them to subscribe to REA with the threat of future taxation hanging over them."

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Roosevelt Signs Order for Priorities Board

The executive order of President Roosevelt last week setting up a priorities board means only—for now, at least—creation of formal machinery to run an informal and voluntary program of keying defense orders ahead of private orders where conflicts occur.

Informal priorities have been in effect for several weeks, with industry voluntarily providing its own regulation. Donald M. Nelson, named priorities administrator in the President's order, said he hasn't a single specific case in mind now where he wants this voluntary system displaced by government edict. Particular value of invoking the authority under recent legislation permitting priorities will be to provide legal protection against suit for private operators who agree to accept delays in deliveries so that manufacturers can meet defense schedules.

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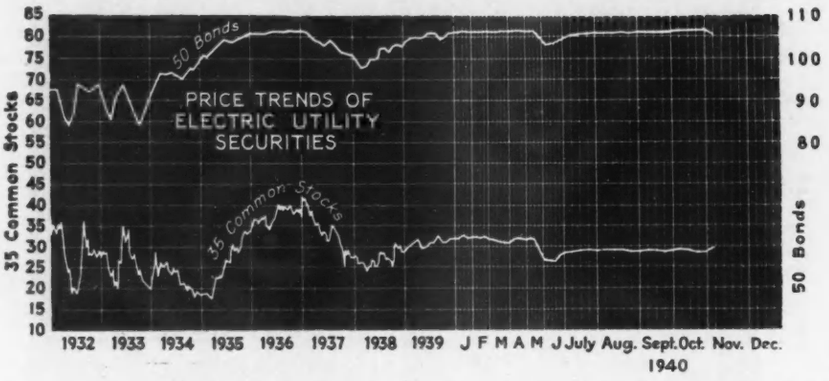
Kentucky Power Project to Cost $21,000,000

The United States Engineers Office, Nashville, Tenn., has surveys nearing completion for a flood control and hydro-electric power development on the Cumberland River, Russell County, Ky., about 14 miles from Jamestown, Ky.

Project will include a power dam approximately 230 ft. high, to be known as the Wolf Creek dam, and will inundate about 60,000 acres of land; hydro-electric generating station of capacity now being determined, with switchyard structure, transmission lines, power substations and other electric operating facilities. Entire development is estimated to cost about $50,000,000, of which $21,000,000 will be used for the hydro-electric project and the remainder for flood control.

Utility Stocks Move Upward; Bonds Lower


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
50 Bonds
35 Common Stocks
35 Common Stocks
50 Bonds
1932 1933 1934 1935 1936 1937 1938 1939 J F M A M J July Aug. Sept. Oct. Nov. Dec. 1940

Prices of electric light and power stocks advanced this week, carrying the "Electrical World" index up to 29.0 from 28.7 the preceding week; last year, 31.6. Bonds dipped, "Electrical World" index, 105.9; last week, 106.1

Urges SEC to Speed El Paso Financing

Donald C. Barnes, president of Engineers Public Service Co., urged prompt action by the Securities and Exchange Commission to permit the early marketing by the company's subsidiary, El Paso Electric Co., Texas, of $6,500,000 of 3¼ per cent first mortgage bonds and 24,000 shares of $5 dividend preferred stock.

"We are in a very delicate market situation which may be upset at any moment by international events or by the outcome of our national election on November 5," Mr. Barnes said at a public hearing before SEC. "The loss of the market now available for these securities would, in my opinion, be a catastrophe for the company because the program which would thereby be defeated is, in my opinion, a constructive one and greatly in the interest of the public."

The bond and stock issues are part of a program for merging Mesilla Valley Electric Co. into El Paso Electric Co., Texas, the refinancing of the latter company and the dissolution of El Paso Electric Co., Delaware.

Testifying on the benefits of the program, Mr. Barnes told the SEC that the transaction would result in simplification of the corporate structure of Engineers Public Service Co. through elimination of a subholding company, El Paso Electric Co., Delaware, and the elimination of an operating subsidiary, Mesilla Valley Electric Co.

•

Consolidated Edison Net

Consolidated Edison Co. of New York, Inc., and subsidiaries for the twelve months ended on September 30 report a net income, after all operating expenses, taxes and special charges, of $36,224,811. This was equal, after preferred dividend requirements, to $2.21 a share on 11,471,527 common shares, and compared with $35,770,846, or $2.17 a common share, in the twelve months to September 30.

•

Utility Plans Private $3,000,000 Bond Sale

Sierra Pacific Power Co., it is reported, is negotiating with insurance companies for private sale of about $3,000,000 of thirty-year first mortgage bonds, bearing interest not exceeding 3¼ per cent a year.

A special meeting of stockholders has been called for November 15 at Portland, Me., to authorize company to create a mortgage permitting issuance of up to $4,000,000 of new bonds.

•

Baltimore Officials Act on Resignation Order

Certain top executives in the Consolidated Gas Electric Light & Power Co. of Baltimore, including Herbert A. Wagner, president, chairman of the board and director, have resigned interlocking positions in the Aldred-Baltimore system pursuant to orders entered by the Federal Power Commission. The board of directors of the Baltimore company also has adopted a resolution terminating the employment of Aldred & Co. for advice and assistance in financial and other matters.

Other executives who have resigned certain positions in accordance with the commission's orders include: Charles M. Cohn, executive vice-president, director and member of the executive committee of the Baltimore company, who resigned as a director of the Pennsylvania Water & Power Co. and the Safe Harbor Water Power Corp.; John A. Walls, president of the Pennsylvania Water & Power, who resigned as president and director of the Safe Harbor Co., and Mortimer N. Buckner, who resigned as a member of the board of the Baltimore company and of the Safe Harbor Corp.

•

Late Competitive Bid Upset Utility Offer

Offering was made last week of $16,500,000 of first mortgage 3½ per cent bonds, due in 1970, of the San Antonio Public Service Co. The bonds were priced at 107½. Proceeds from the sale will be used by the company for the redemption at 105 of the company's outstanding $16,500,000 of 4 per cent bonds, due in 1963.

Because of last-minute developments in the deal, involving the injection of an "outside" or competitive bid for the issue, which resulted in revision of the original underwriting terms and offering group, the pattern of distribution of this issue marked a departure from the usual procedure in a public offering of an issue which has passed through registration with the SEC. There was no customary selling group and the bonds will be sold to a large extent wholesale, or in large blocks to institutional investors. This change was made necessary by the sharp reduction in the underwriting spread from a contemplated 2 points to ½ point.

The original underwriting syndicate was reduced in size, some of the members withdrawing following the change in terms. The deal, which had been negotiated and planned between the company and the original underwriting group at considerable expense to both, became virtually "a private placement" as a result of the submission of an alternate offer to the company which forced the price to a point where true public offering was impossible.

Utility Reports

	Net Income 1940	1939
*Arkansas Power & Light..	$1,090,985	$1,419,873
*Central Arizona Lt. & Pwr.	897,141	823,248
*Commonwealth & Southern and subs.	13,446,679	13,028,164
*Electric Bond & Share...	9,275,608	9,721,480
*Kansas Gas & Electric...	1,415,596	1,166,454
*Louisiana Power & Light.	1,058,353	1,029,413
†Middle West	1,161,156	812,562
*Minnesota Power & Light.	1,383,061	1,303,127
*Mississippi Power & Light	474,251	506,858
*Nebraska Power	1,639,442	1,883,883
*New Orleans Public Service	2,664,797	1,821,604
*Pacific Power & Light and sub	862,801	940,953
*Texas Power & Light.....	1,951,581	2,218,116
*Washington Water Power and sub	2,983,302	2,996,148

* Twelve months ended September 30.
† Nine months ended September 30.

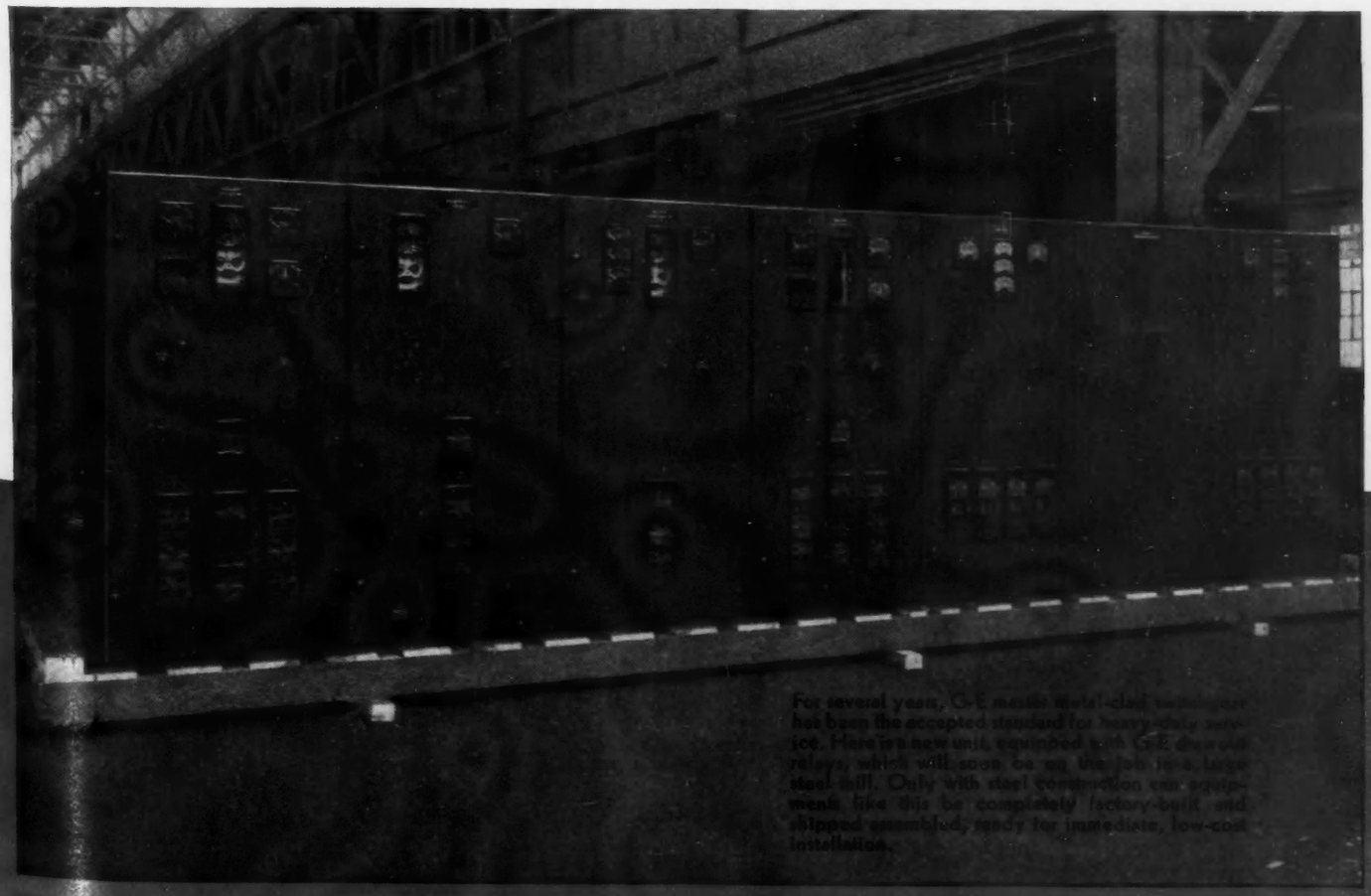
STRENGTH of DETAIL

that Makes G-E Metal-clad Switchgear So SAFE and DEPENDABLE

EVERY part of G-E metal-clad—from framework and housing to relay cradle—is designed and built to ***keep the power on*** even in the toughest kind of service, and to provide for maximum safety under all conditions. We recognize the fact that sound ***functional*** design alone is not enough. Careful attention is given to ***structural*** design and the best choice of materials. Vital structural parts are made of steel, for we have found that *steel gives strength where strength is needed.*

Let Us Give You the Complete Story

Find out all about G-E metal-clad—its removable breakers, for easy maintenance; its drawout relays, always accessible and easy to test; and its many other outstanding features. Your G-E representative will be glad to give you more facts and have a specialist assist you in studying the needs of your plant. Call him today. General Electric Company, Schenectady, N. Y.



For several years, G-E metal-clad switchgear has been the accepted standard for heavy-duty service. Here is a new unit, equipped with G-E drawout relays, which will soon be on the job in a large steel mill. Only with steel construction can equipments like this be completely factory-built and shipped assembled, ready for immediate, low-cost installation.

GENERAL ELECTRIC

355-7

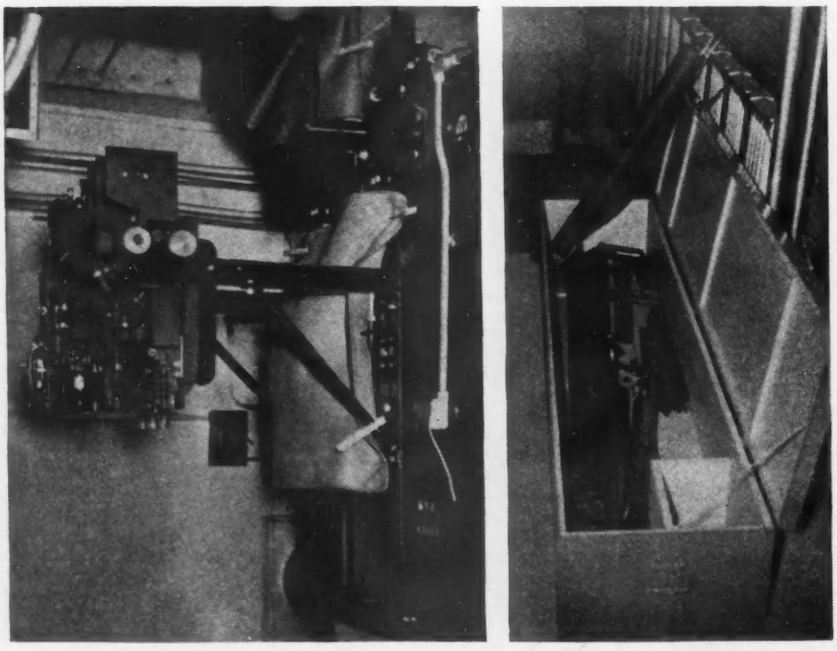
OPERATING PRACTICES

Portable Roll-out for Switch Maintenance

To have specified individual roll-outs on all 24 of the transformer-mounted, open-type, network switches currently in use on the Dallas Power & Light Company's underground system would have increased the investment costs about $100 per switch. To avoid this investment and still gain the advantages of easy maintenance, provided by the roll-out feature, a demountable roll-out frame was devised that can be readily attached to any of the network switch installations on the system for maintenance and as readily removed when the work is finished.

Prior to the development of the roll-out shown, it was necessary to de-energize the feeder to which the switch was connected and actually demount the switch from the transformer and place it on the floor of the vault for maintenance. This operation required the services of a cable crew to remove the switch from the transformer, as well as the maintenance crew to service the switch. The cable crew was again required to remount the switch on the transformer and re-energize it.

With a roll-out, such as the one illustrated, it is no longer necessary to de-energize the feeder, but merely de-energize the switch, roll it out into the position shown, cover energized terminals with a rubber blanket, and proceed with the maintenance. The cable crew is not needed to remove the switch from service.



DEMOUNTABLE roll-out for open-type, transformer-mounted network switches makes for quick, easy maintenance (left). Roll-out frame in box ready to be taken out on the job (right)

•

Team Capacitors and Line Regulators

Because high reactive kva. on distribution lines usually goes hand in hand with poor voltage regulation and because the installation of shunt capacitors, while counteracting the effects of excessive reactive current and releasing copper capacity does not improve voltage regulation, installation of shunt capacitors on the system of the Public Service Company of Oklahoma is usually coupled with the installation of pole-top regulators on the line itself. Use of the regulators out on the line has the advantage of extending the zone of good regulation out from the substation and keeps down the size of the regulator required.

Take, for example, the circuit shown in the diagram. Measurements on this feeder over a year revealed a variation in reactive kva. between 311 and 800, while kw. load varied between 240 and 1,345.

To correct to a 95 per cent power factor during the summer peak (condition of maximum drop) about 450 kva. in capacitors were needed and were allocated as indicated on the diagram.

Simple calculation revealed the voltage rises due to the capacitors since they are equal to the product of the leading current and the reactance of any section. These rises referred to base voltage were then subtracted arithmetically from the drops to give the full- and light-load voltage drops with capacitors in the circuit.

HERE'S THE PROBLEM A CENTRAL STATION GAVE US

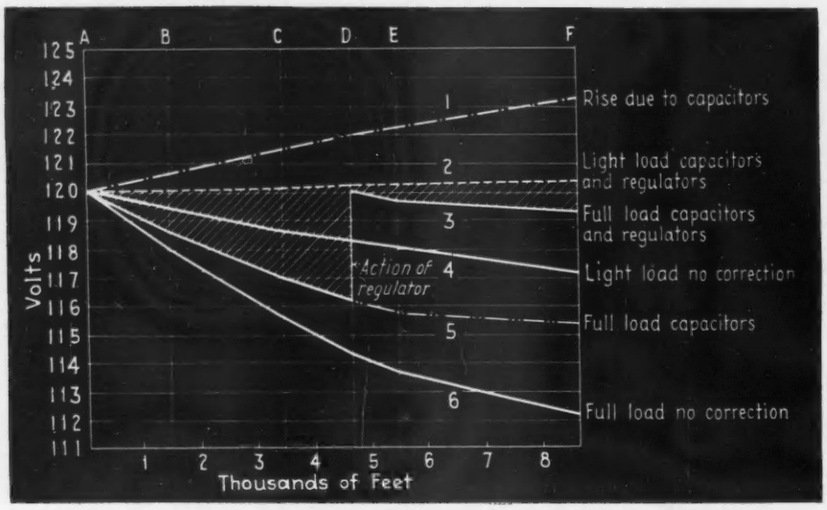
"We need a station control cable which will allow high current densities during peak load periods. Then, it must resist extreme ambient temperatures successfully. In addition, it must be flameproof and physically tough, able to stand a lot of severe treatment. We don't want to use rigid conduit, so it must have an outside cover that will take the place of conduit and still give the cable the same protection."

That was a pretty tough nut to crack, but G-E Deltabeston engineers went to work, and the cable you see here was able to meet all the requirements and is giving satisfactory service right now.

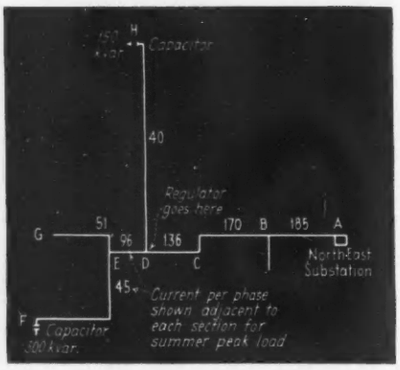
Deltabeston Power Cable, Deltabeston Resistor Cable, Deltabeston Switchboard Wire will all give you outstanding service. But—if you need an an "extra special" cable, custom-built for a particular installation—let us help you. Let Deltabeston engineers give you the benefit of their years of experience.

We'll be more than glad to serve you whenever you have a problem similar to the one above. But in the meantime, get a copy of the complete General Electric Deltabeston Catalog by writing to Section Y-0131, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC



TEAM CAPACITORS and line regulators to improve voltage condition economically: with both capacitors and regulators voltage at any point varies between (2) and (3) with regulators at D



ALL DROPS in diagram are referred to a base voltage of 120. Voltage leaving substation would generally be 122-123. In diagram regulator was taken to be set without compensation to maintain 120 volts at outgoing side

Circuit Constants

	No.	R	X
A-B = 1,500	2/0	0.125	0.198
B-C = 1,950	2/0	0.163	0.258
C-D = 1,230	2/0	0.103	0.162
D-E = 800	2/0	0.067	0.155
E-F = 3,150	2	0.526	0.444
E-G = 1,650	2	0.276	0.233
D-H = 5,280	2	0.883	0.742

From these data the voltage curves 1, 2, 4, 5 and 6 were plotted for the A-F section of line.

Although the installation of the capacitors had the effect of raising both light- and full-load voltage curves, the regulation at point F remained unchanged both with and without capacitors. Some form of voltage regulation was therefore indicated in conjunction with the capacitors if the zone of good voltage regulation is to be extended outward from the substation.

Installation of pole-top regulators at point D on the circuit and compensating for the approximate load center has had the advantage of regulating voltage nearer to the load than would be the case if it were installed at the substation. Also, a smaller, less expensive regulator can be used, since at D the current to be handled by the regulator would be less than at the substation.

Exact location of the regulator depends upon the allowable regulation for the section from the substation to the point of regulation. Under ideal conditions, with uniform load density along the line, best location would be where voltage regulation at the regulator was equal to regulation at the end of the line. In this case the ideal would have been approached with the regulator at C. However, the increased cost of a regulator to handle current at C more than offset the improvement in regulation that would have been secured at point D, where the regulator was finally placed.

Design Metal Head for Street Lights

By O. K. CORNELL*
Buffalo Niagara Electric Corporation
Buffalo, N. Y.

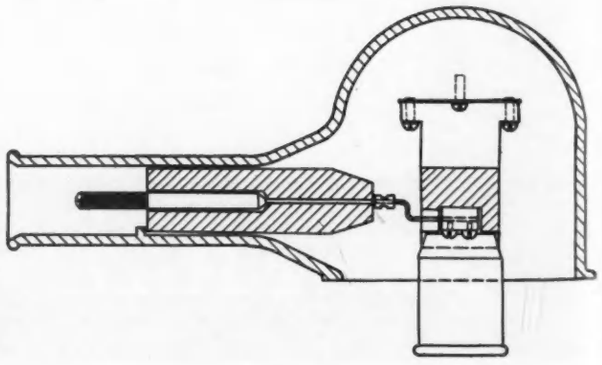
A metal head for street lighting pendant luminaires for side cable entrance has shown these advantages over units wired from the top: it is easier to assemble; provides a simpler, safer wiring job; permits effective reduction of cable temperatures; has higher flashover values, and improves mounting height.

The metal head is approximately 6 in. in diameter and has a suitable neck to provide slip fitter mounting. The wet-process porcelain receptacle has a dry flashover of 25 kv. and a wet flashover of about 17 kv. Single-conductor cable used consists of No. 8 copper with 10/64-in. corona-resisting rubber insulation with weatherproof braid.

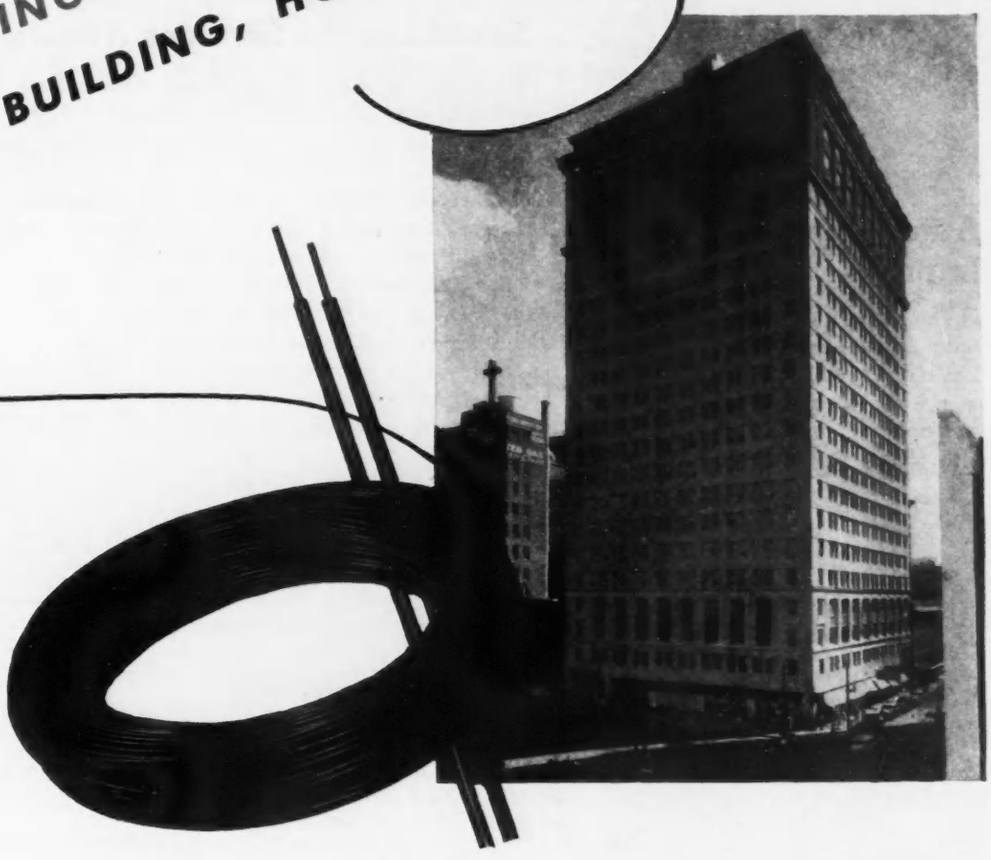
To protect the cable from the increased temperatures involved with high-intensity lighting—10,000 and 15,000 lumens incandescent—a piece of wet process porcelain about $5\frac{3}{4}$ in. long is installed in the neck of the metal head. Two holes extend throughout its length; at one end the holes are large enough to permit full-voltage insulation to be retained for the first three inches, then the diameter of the holes is reduced to the size of the bare copper conductor. Bare wire is continued through the porcelain to the point where it connects with the receptacle terminals. Flashover value of the porcelain and air gap in the head permit the entire wired assembly to sustain 20 kv. at

*Adapted from paper presented before Empire State Gas and Electric Association, New York, N. Y.

SIDE ENTRANCE wiring head for street lighting pendant luminaires reduces temperatures on cable insulation by 54 deg. C. over top entrance designs



100,000 FEET OF FLAMENOL* BUILDING WIRE USED TO REWIRE SHELL BUILDING, HOUSTON, TEXAS



"ENTHUSIASTIC OVER SAVINGS" — SAYS BUILDING OWNER "EASY TO INSTALL" — SAYS ELECTRICAL CONTRACTOR

The 14 upper floors of the Shell Building, Houston, Texas, have been rewired with Flamenol Small Diameter Building Wire to provide for increased illumination. The Shell Building is comparatively new. When it was opened 14 years ago its wiring was completely adequate according to the standards of that day. But today's lighting requires heavier wiring.

Consequently, the owners of the building, the New England Mutual Life Insurance Co., of Boston, Mass. wanted the wiring improved. They called upon the Jacobe Bros. Electric Co. to devise a satisfactory and economical way to bring the wiring abreast of the times. Jacobe Bros., incidentally, wired the building originally.

To solve the present problem, approximately 100,000 feet of No. 12 Flamenol Building Wire were used to replace the existing wires in existing branch circuit raceways. New risers were installed using five tons of G-E White Conduit and G-E Code Grade Building Wire. G-E Performance Grade Wire was used for main elevator feeders.

New Life for Old Buildings

Small Diameter Flamenol Building Wires enable wattages in existing buildings to be increased inexpensively. The present wires in existing conduits can be replaced with more wires or with wires of larger capacity. Flamenol Building Wire is available in sizes 14 to 4/0 inclusive. It is insulated with a plasticized polyvinyl chloride compound. This insulation is tough, flame retarding and is high in dielectric and mechanical strength.

For further information on Flamenol Building Wire and for samples, see the nearest G-E Merchandise Distributor or write to Section WF-0131, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

*Reg. U.S. Pat. Off.

GENERAL ELECTRIC

a normal frequency of 60 cycles.

Temperature of the cable insulation has been reduced to 76 deg. C. with this new design as compared with approximately 130 deg. C. in the top entrance types. While this resultant temperature is 11 deg. C. above the limit recommended by the cable manufacturers, it is not serious at this point, since the cable is located inside the porcelain—providing additional insulation to ground as well as between conductors. A temperature gradient is established throughout the length of the porcelain from 100 deg. C to 58 deg. C.

The mounting height is increased about 12 in. as compared with top entrance designs.

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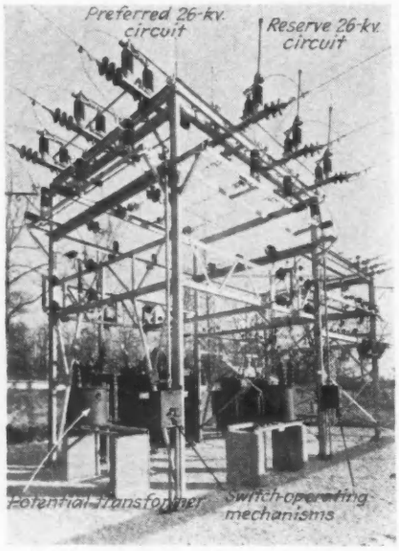
Automatic Switches Improve Reliability

The change from preferred to reserve 26-kv. feeder upon loss of voltage and the return to preferred operation with voltage restoration on the original line, through use of relay-controlled, motor-driven, air-break



AUTOMATIC air-break disconnects switch 1,500-kva. bank from main to reserve supply line on loss of voltage; return to original condition automatic on voltage recovery

switches has permitted Wisconsin Electric Power to insure practically continuous service to the 1,500-kva. transformer bank at Howard Avenue substation. This substation supplies three important 4.8-kv. distribution circuits.

As would be expected, fuse-protected potential transformers connected on the line side of the high-voltage disconnect switches of both main and reserve lines provide power for the operation of the switches. Motor circuits are controlled by voltage-actuated relays.

On loss of voltage on the preferred line, potential from the energized reserve line is applied to open the normally closed air-break disconnect switch on the faulted line and then close in a similar normally open switch on the reserve line, restoring supply to the step-down transformers.

With restoration of voltage on the preferred line its air-break switch closes automatically, after which the reserve line switch opens, restoring the substation to its normal operating arrangement without the attention of either an operator or trouble man, and without even a momentary interruption of service.

• • •

Standards for Services Attached to Buildings

The following standards have been adopted by the Detroit Edison Company for service installations on buildings:

Contacts on buildings shall be made with service insulators for wire sizes No. 2 and smaller with normal service sag and for No. 4 and smaller with one-half normal service sag; with secondary racks for No. 2 with one-half normal service sag and for No. 0 and No. 0000, and with secondary dead-end spools for 350M and 500M.

Substantial building supports should be had for holding drops. Service drops shall not be attached to fire or parapet walls unless a suitable riser is first installed. Contacts on chimneys ordinarily shall not be made. Contacts on roofs shall not be made unless the customer provides a suitable support.

The following notes are essential: (1) Do not install service insulators in belt, soldier course, outside verge board, inside verge board on brick or in upper three layers of solid brick unless a substantial support approved by overhead lines department is installed. (2) The lags holding secondary racks or short screw service insulators shall not be screwed into the end grain of wood where used to attach service to buildings. (3) Service insulators may be installed in inside verge board of frame house.

1. Service Insulator Attachments:

(a) On wood—Use 2-in.* service insulator. Drill a $\frac{5}{16}$-in. hole through siding to prevent splitting.

(b) Wood siding and composition sheathing—Use 4-in. service insulator. Drill a $\frac{1}{4}$-in. leader hole into stud or plate.

(c) On brick veneer.

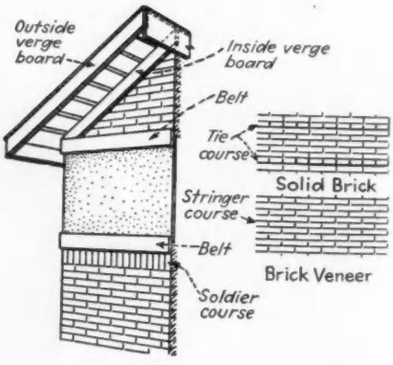
(I) With wood sheathing—Use 6-in.* service insulator with screw passing through mortar joint into sheathing.

(II) With composition sheathing—In plate or support between studs $7\frac{1}{2}$-in.* service insulator. In support between brick and sheathing 6-in.* service insulator. Screw may pass through mortar joint or brick as necessary.

Where the sales department does not require the customer to provide a suitable support (or plate) $7\frac{1}{2}$-in.* service insulators in studs are necessary.

(d) On hollow tile and cement block—Use toggle bolt service insulator. Drill a $\frac{3}{4}$-in. hole through first wall of tile or block.

(e) On solid masonry (brick or cement)—Use 2-in.* service insulator set in $\frac{5}{16}$x2-in. wood screw anchor. Drill hole



INSTALLATION DIAGRAM of services on buildings

$2\frac{1}{4}$ in. deep with a $\frac{1}{2}$-in. drill, preferably in the brick than in the mortar.

2. Secondary Rack Attachments:

(a) On wood—Use two $\frac{1}{2}$x5-in. lag for short services and two $\frac{5}{8}$-in. machine bolts back with large plate washers for long services. Drill a $\frac{3}{8}$-in. hole for $\frac{1}{2}$-in. lag and $\frac{13}{16}$-in. hole for $\frac{5}{8}$-in. bolt.

(b) On brick veneer—Use two $\frac{1}{2}$x7-in. lag screws with screw passing through mortar joint or brick into sheathing or support. Drill a $\frac{3}{8}$-in. hole through sheathing or support.

(c) On solid masonry—Use two $\frac{1}{2}$x4-in. machine bolts set in $\frac{1}{2}$-in. machine bolt anchors for short services (drill holes 3 in. deep, with a $\frac{7}{8}$-in. drill and two $\frac{5}{8}$-in. machine bolts backed with large plate washers for long services (drill $\frac{7}{8}$-in. hole).

3. Secondary Dead-end Spool Attachments:

Attachments shall be similar to those for secondary racks.

*Dimensions refer to length of screw in service insulator.

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WATCH FOR ANNOUNCEMENT!

The *new* Electrical Buyers Reference — 1941 edition — will soon be ready for distribution. Completely revised, with new listings, expanded manufacturers' catalog section, and bigger than ever, EBR for 1941 will be ready around the end of December. We'll be able to give you full details on this extra useful volume next month. Meantime, use your 1940 EBR to speed up buying for year-end rush jobs.

Electrical BUYERS REFERENCE

330 WEST 42nd STREET, NEW YORK • A UNIT OF THE McGRAW-HILL REFERENCE SERVICE

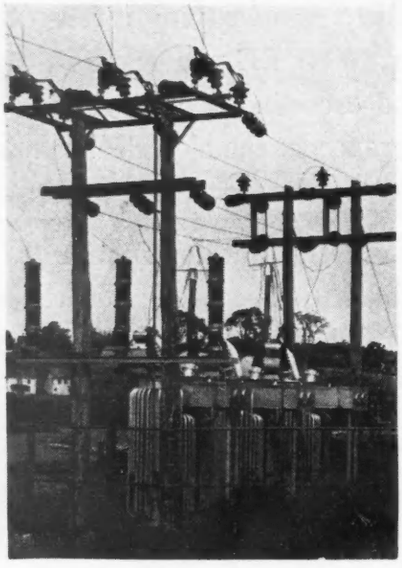
INDUSTRIAL ENGINEERING

Simple Structure Aids Substation Designers

The advantages of a simple structural layout in industrial substation practice are well illustrated in the most recent outdoor installation supplying a portion of the Eastern Corporation's paper mill at South Brewer, Me., with energy from the Bangor Hydro-Electric Company's system. The new unit consists of a 2,000-kva. bank of transformers in three single-phase set-ups, stepping energy down from 44 kv. to 500 volts for mill circuits. The incoming line terminates at the top of a two-pole structure carrying manually operated air-break switches on a structural steel support of rectangular shape, jumpers connecting the incoming phase wires with the switch terminals by short runs from the strain insulator disks.

On the further side of the rectangle jumpers connect with studs in strain insulators at which horizontal leads from a second terminal structure end and beyond these pin-type insulators carry other jumpers across the top of the two-pole set-up to fuses mounted between the horizontal crossarms as shown. The phase wires are then brought back to the first pair of poles, terminating on strain insulators, and from these wires down taps are run to the transformers directly below. Thyrite lightning arresters are mounted on a structural steel member on the first pair of poles, and short taps from the incoming circuit connect with these with a most economical arrangement of copper.

From the transformer secondaries connections are brought into an adjacent brick terminal house in underground duct, and after the necessary oil circuit breaker and metering facilities are met, three 750,000-circ. mil copper leads are brought out of the building through a riser pipe and carried to the top of a double-pole distributing structure as open leads from which outdoor connections are taken to the mill. The design is free from complications, uses material economically and is electrically continuous.



RIVERSIDE substation illustrates compact layout

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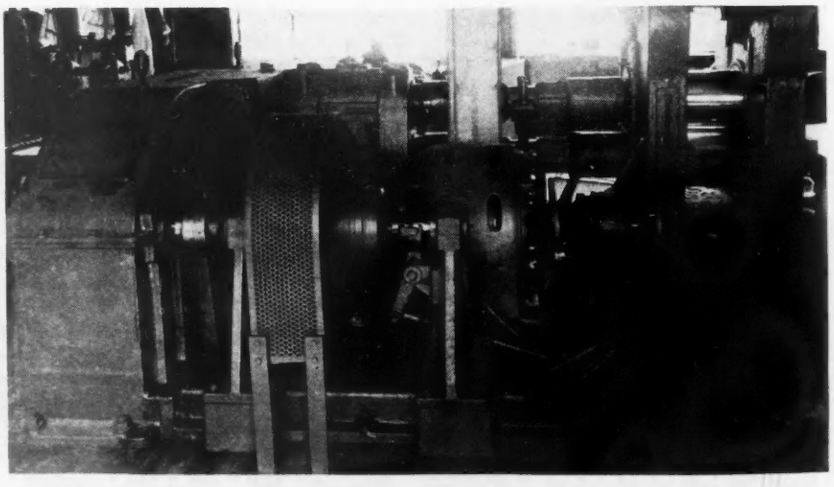
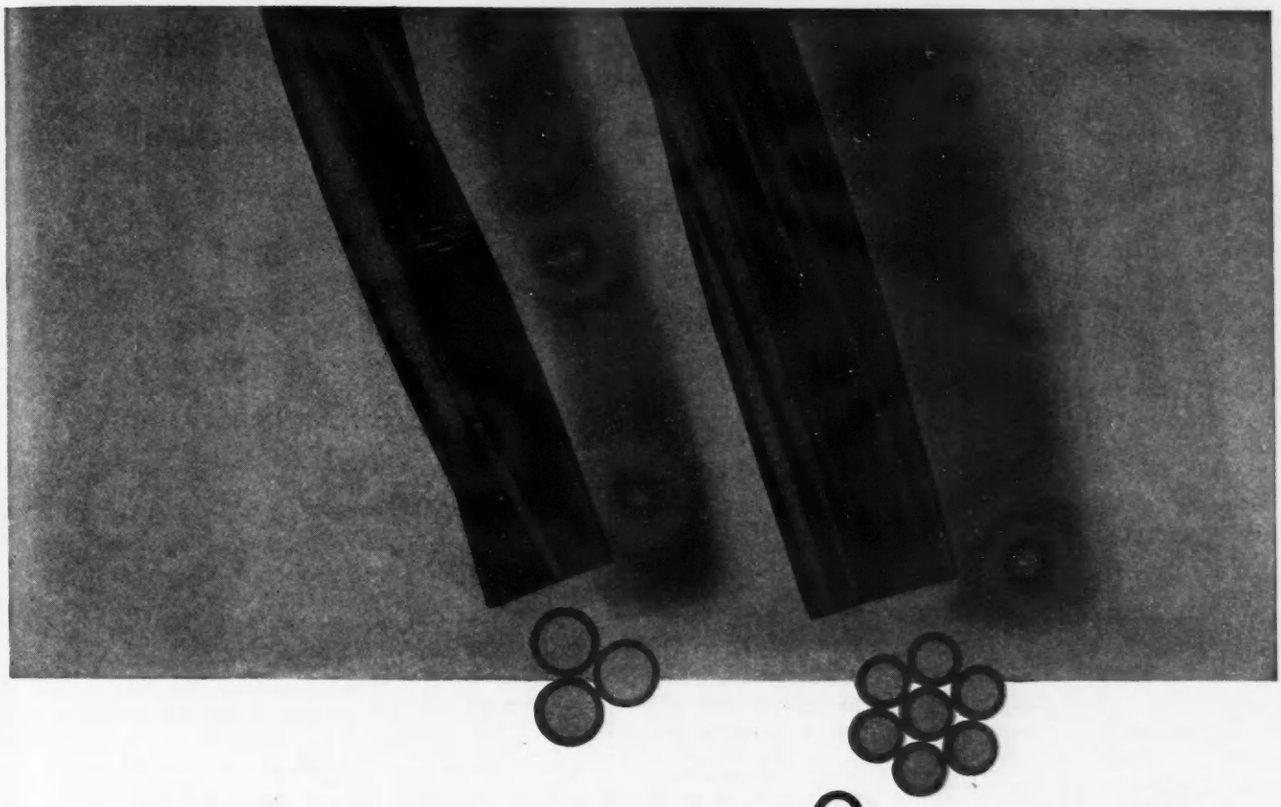
Synchronous Motor Drive for Gold Mill

Although the corrective action on power factor of a 60-hp. synchronous motor drive of a rolling mill at the plant of the D. E. Makepeace Company, Attleboro, Mass., totaled but 3.5 per cent with a connected load of 1,350 kva. in the manufacturing group concerned, the installation has been advantageous also in meeting the requirements of a variable demand for power at substantially constant speed. The mill was manufactured by the Standard Machinery Company, Auburn, N. Y., and is used for rolling either gold or silver plate



SPEED REDUCTION in synchronous drive (120 to 1) serves precious metal plant

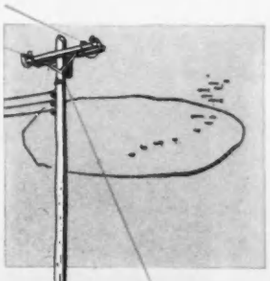


RUST INSURANCE 2¢ A YEAR

YES—2 CENTS A YEAR. Let's take a 40 foot guy. Copperweld strand costs approximately 1¢ a foot more than rustable strand of equal breaking strength—that's 40¢. Assume the life of the line to be 20 years, (actually Copperweld strand has the rust resisting life of solid copper), then the total premium to insure this guy against rust is 40¢—an annual premium of only 2¢.

Rust insurance *is* important. Guys play a vital part in the safety of your lines. Every sleet or wind storm tests them. The failure of a single rusted guy can cause dangerous and costly damage.

Copperweld strand is "insurance" against rusting. The thick layer of pure copper inseparably molten welded to the tough steel core provides permanent protection. Serving, bending or clamping will not harm Copperweld—the thick ductile copper will not crack, flake or peel. Copperweld guy strand is doubly guaranteed: you get guaranteed copper thickness on each wire—and the guaranteed rust resisting life of solid copper in the finished Copperweld guy strand.



COPPERWELD STEEL COMPANY, GLASSPORT, PENNSYLVANIA

COPPERWELD

Non-Rusting

GUY STRAND

stock from 1 in. down to 0.050 in. in thickness.

The hardened steel rolls are 14 in. long x 12.5 in. in diameter and the drive is through reduction gearing running in oil, with a clutch between the motor and the main shaft. The motor, supplied by the Electrical Machinery Manufacturing Company, is a 220-volt, three-phase machine, running at 1,200 r.p.m. and provided with a direct-connected exciter carried outboard on the shaft and screened in for safety. All parts of the drive are protected by guards, including the front of the unit shown in the accompanying illustration, whence a portable wooden guard has been temporarily removed on the aisle side of the machine for pictorial purposes. The machine is started as an induction motor.

In the plant are electric furnaces totaling 720 kw. and a number of induction motors which must frequently be run underloaded on account of the variations in work handled. The demand of the factory group where energy is centrally supplied and metered is now 400 kw. and the power factor was raised to 81 per cent from 77.5 per cent by the installation of the above motor drive.

•

Junction Box Scheme for Tapping Sub-Feeder

There are a multiplicity of methods in use for tapping sub-feeders in industrial plants to provide flexibility in distributing power to production machines. At the Minneapolis plant of the Minneapolis-Honeywell Regulator Company the system used has a number of points in its favor. Prominent among these are its applicability to new and existing buildings, its tendency to keep down the length of branch circuit runs from sub-feeder to machine, flexibility, and the ease with which it permits co-ordinating fuse and circuit identification.

Essentially, the system uses ceiling-mounted metal junction cabinets at convenient intervals along sub-feeder conduit runs emanating from main fuse cabinets. Each junction box houses "stub buses" connected to the sub-feeder circuits and provided with convenient terminal lugs to which individual machine circuits may be easily connected. The junction boxes

STUB BUSES in conveniently spaced ceiling junction boxes along sub-feeder conduit runs provide flexible means of taking off taps to production machines

are spaced close enough together to keep the conduit runs to individual machines under 25 ft. in length. In general, two circuits (No. 2 and No. 4 or 6 wire) are available at each junction box, although single-circuit boxes are used in some locations. The two-circuit box is 24x12x6 in. and the single circuit box is 12x12x6 in. Number of branch circuits connected to sub-feeder circuits at each juction box is limited only by carrying capacity of sub-feeder copper.

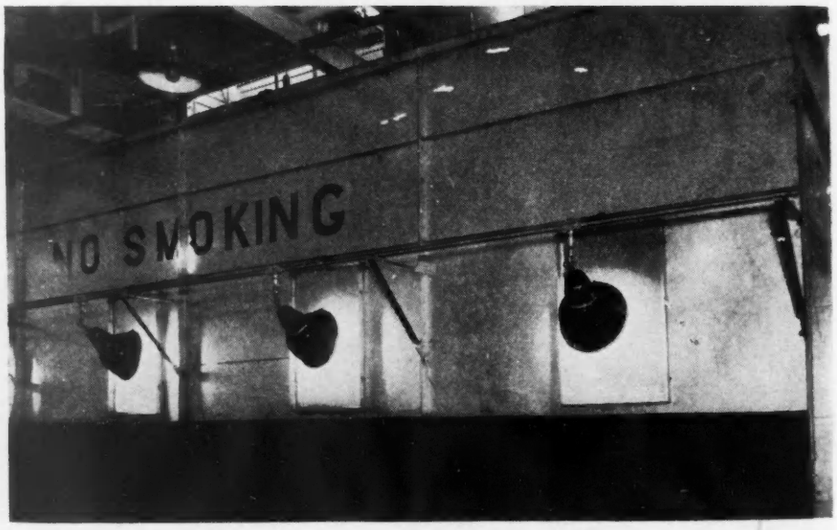
To simplify the co-ordination of fuses and machine circuits each main fuse cabinet bears a letter and each junction box bears the same letter as well as a circuit number or numbers corresponding to the number of the sub-feeder fuse in the cabinet. Thus, if all the machines connected to single-circuit junction box C 12, for instance, cease to operate, the electrician merely notes the number and letter on the box, goes to cabinet C and renews fuses on No. 12 circuit.

•

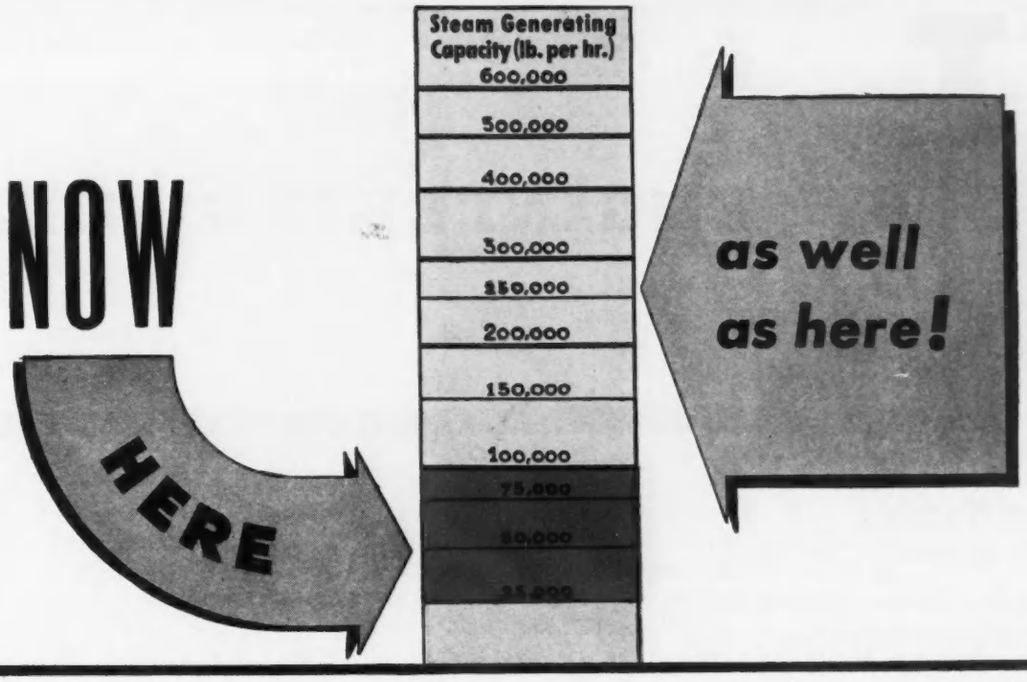
Lighting Spray Booth From Outside

In a New England industrial plant making machine tools to supply the market for military equipment it was considered vitally important to maintain the inside of the spray booth clear of all obstructions, as well as to introduce no explosion hazards in case of electrical circuit troubles. The spray booth, of DeVilbiss design, is 50 ft. long x 12 ft. wide x 11 ft. high, and on each outer side wall are ten 200-watt tungsten lamps mounted in angle reflectors just outside wired-glass windows 17¼ in. wide x 29¼ in. high.

These units are carried by fittings served from 1-in. conduit and supported by 1¼-in. x ¼-in. strap-iron brackets attached to the steel framing of the booth walls. The lighting units total 20 and are mounted on 5-ft. centers, having gas-tight reflectors, and provide satisfactory illumination through the glass panels for intensive spraying operations.



CLOSE-UP of reflector units mounted in shop to leave interior of spray booth free for operations on machine tools

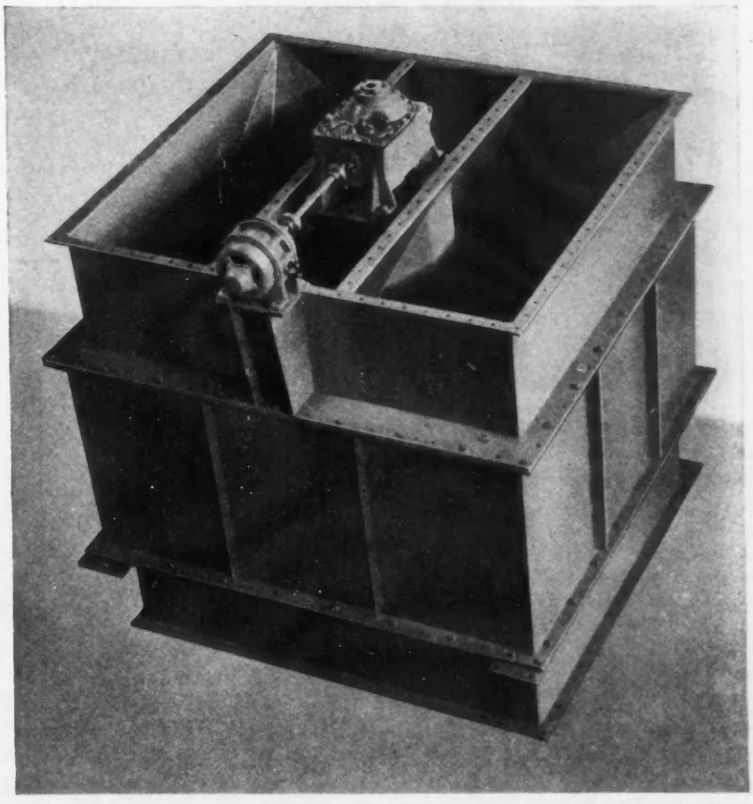


The Modern Ljungstrom Air Preheater has a clear margin of advantage in the economic balance

Today, there's an important new factor to be considered in boiler-plant heat-recovery economics for units in the 25,000–100,000 lb. per hr. capacity range. The Ljungstrom Air Preheater (Rectangular Type) is now available at a *reduced first-cost,* expanding greatly its justifiable application in boiler plants of moderate size.

In the nation's largest and most efficient power plants, the Ljungstrom is already far and away the most popular type. Service records for 10 years and more have confirmed its thermal and mechanical advantages.

Now, the same benefits of the *continuous regenerative counterflow* principle are brought *economically* into lower capacity ranges. We suggest you write for information on current installations and other data on this significant advance.



THE AIR PREHEATER CORPORATION

Executive Offices: 60 East 42nd St., New York, N. Y. **Plant: Wellesville, New York**

NEW ENGINEERING IDEAS

Induction Heating for Inside Bores

A new method of heat treating metals by electrical induction which makes possible the hardening of inside diameters of cylinders and other bores has been developed by Budd Induction Heating, Inc. The process makes possible the heat treatment of inside diameters of metal cylinders from 2 in. in diameter up and up to 50 ft. in length, it is said.

AUTOMOBILE hub in place in induction heat-treat machine just after hardening operation has been completed

The head of the machine has been lowered into the barrel of the hub, bringing the surface of the bore to a high temperature by means of electrical induction, and then withdrawn as water is forced at high pressure to a quenching fixture. The whole operation is completed within a few seconds.

The area treated, depth of treatment and the degree of hardness developed are controlled within close limits, while timing of the entire operation is a matter of seconds. In hardening inside diameters in which the treated area is of considerable length, such as engine cylinders, a retracting type head which heats the material by electrical induction is used. This is drawn evenly through the cylinder, followed by a water quench.

On one of the machines now in operation a one-shot type of head is used to harden the bore of automobile hub forgings, thus making the roller bearing race an integral part of the hub. Nearly 2,000,000 pieces have been turned out on these machines during the past three years without a reported failure.

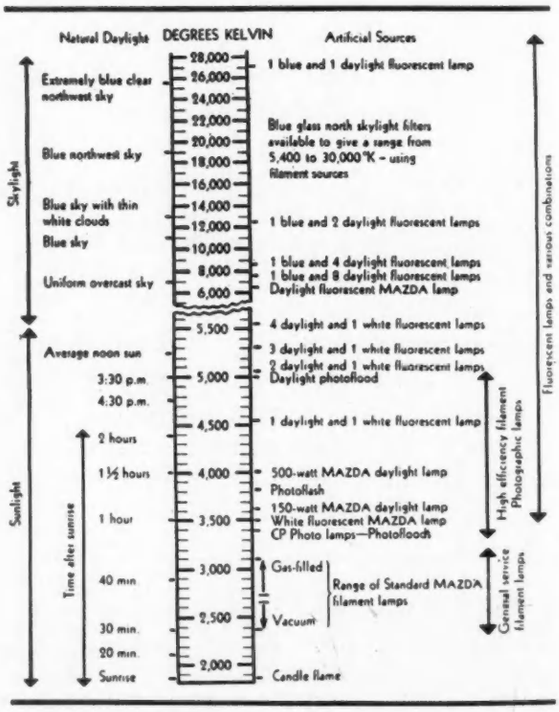
The success of an operation such as this, requiring exceedingly accurate control of area, depth and hardness, in the treated area has led to the further development of the process for inside diameters of widely varying length and sizes of bores. Thus the new treatment may be applied to a wide range of sizes of interior diameters of cylinders and bores of various types.

It is anticipated that the process will find wide use in the metal industry. Other practical applications where it can be used to advantage, according to metallurgists who have observed the process, are the cylinder bores of Diesel, gasoline and steam engines, oil-well casings and the inside diameters of sleeves used in sleeve valve internal combustion engines. A number of other applications are under consideration and developments are being made at the present time.

•

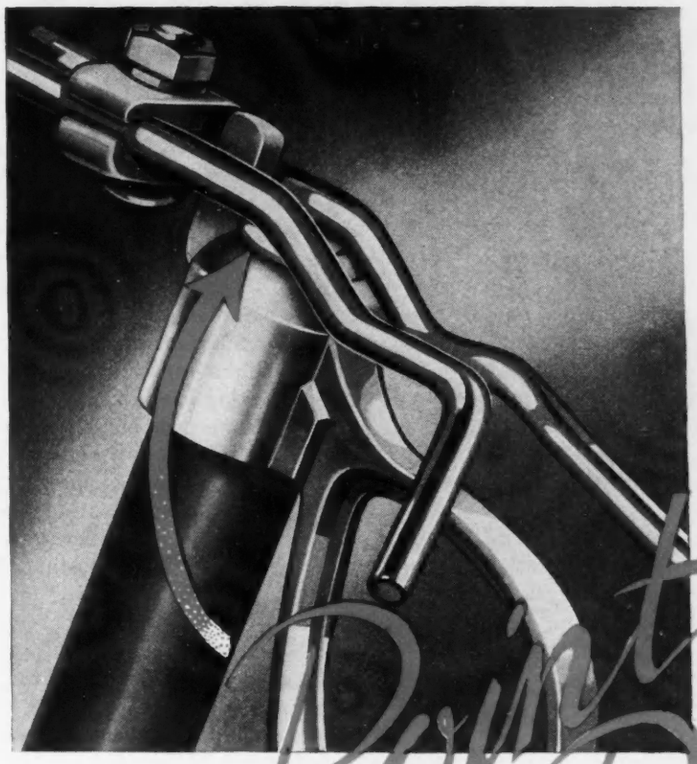
Relates Artificial to Natural Daylight

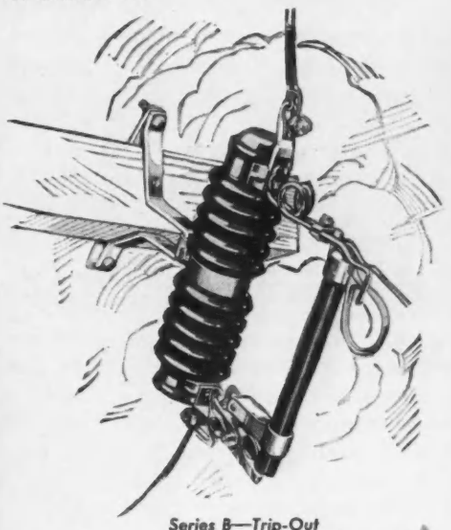
Color temperature is usually measured in degrees Kelvin. The filament operating temperature of a tungsten lamp when expressed in the Kelvin scale is a close approximation of the color temperature, although it departs slightly from the scientific standard (black body radiation) be-



RELATIONS between natural and artificial light

FROM THE ENGINEERING DEPT.—JAMES R. KEARNEY CORPORATION





Series B—Trip-Out
5000 to 15000, 100 Amp.

Point Pressure CONTACTS

OPERATING men will tell you that, regardless of how well a fuse switch might be built, in other respects—it's how long contacts will retain their rated capacity that counts when it comes to dependable, trouble-free switch performance.

So in designing contacts for the Kearney Trip Out Switch, true point pressure contacts were adopted because: point pressure contacts establish a clean, wiped-in pressure surface when in operating position; they are adaptable in establishing direct pressure on the fuse link button head; resilient contact member permits expulsion shock to be harmlessly absorbed —also, permits button head to operate on a poppet valve principle to relieve excessive gas pressures from the top as well as from the bottom of the cartridge.

Yes, we consider point pressure contacts a most important factor in the long, satisfactory performance of the thousands of Kearney Trip Outs in service today and we should be glad to discuss other features . . . How costly cartridge burnouts have been overcome—how this switch gives positive operation on low overloads, as well as on heavy short circuits, and other advantages. A Kearney Representative can give you some profitable information about Kearney Trip Outs, we feel sure. Or, write and we shall be glad to give you the specific details and data.

JAMES R. KEARNEY CORPORATION
4236 Clayton Ave., St. Louis, Mo.
Canadian Plant - Toronto, Canada.

USE **KEARNEY PRODUCTS**
FOR **BETTER** MAINTENANCE and CONSTRUCTION

cause of the selective radiation of tungsten in the visible region. The light from tungsten filament lamps will range from 10 to 40 deg. higher in color temperature than the actual filament temperature.

To show the ease and economy with which most any condition of natural daylight can now be duplicated, the General Electric Company (incandescent lamp department) has developed the accompanying color temperature chart. This shows the extent of the range of natural daylight which can be duplicated by artificial sources.

• • •

Improvements in 287.5-Kv. Disconnects

When work was nearing completion at Boulder Dam, in 1935, engineering interest focused on the equipment for handling power at 287.5 kv. Twelve disconnecting switches purchased in that year by the U. S. Bureau of Reclamation were a part of the equipment.

This year a third circuit at 287.5 kv., still the highest power voltage in use, will be placed in service. Being furnished by Bowie Switch Company, San Francisco, are disconnects which incorporate a marked improvement over the 1935 design.

The principal innovation has to do with the mechanism at the blade end, which applies the contact pressure after blade motion has ceased upon closing. By reducing the number of parts the new design makes for a simpler, more rugged unit.

The switch stands on three insulator columns, about 10 ft. high, one of which rotates to transmit the opening and closing motions. In the accompanying illustration a switch is shown assembled for factory test with the rotating position at the left. The crank at top left swings horizontally to raise and lower the 15-ft. blade.

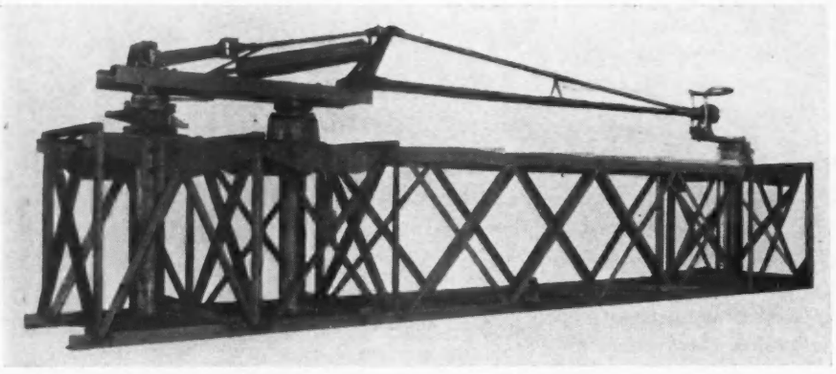
In the closing motion the blade has reached the full closed position when the crank has still a few degrees to move before it is parallel with the blade. The negligible motion in the direction of blade closing through these last few degrees is absorbed by the flexibility of the linkage. However, by cam action, the rotation through these last few degrees moves a rod which causes the contact pressure to be applied.

The assembly at the blade end, from which the upper half of the aluminum housing has been removed, is shown in an accompanying illustration. The clip sticks up between the contact bars. Just outside the contact bars are two shorter spring bars. These function as simple levers with the central bolt for adjusting the contact pressure functioning as a fulcrum.

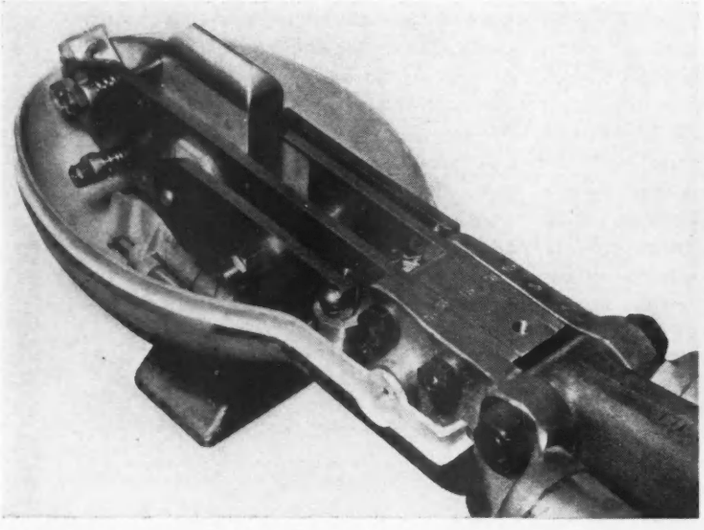
Their rear ends are connected to a toggle. Motion of the rod referred to above pulls the toggle so as to force the rear ends of the spring bars away from each other, hence force their forward ends toward each other and apply the contact pressure.

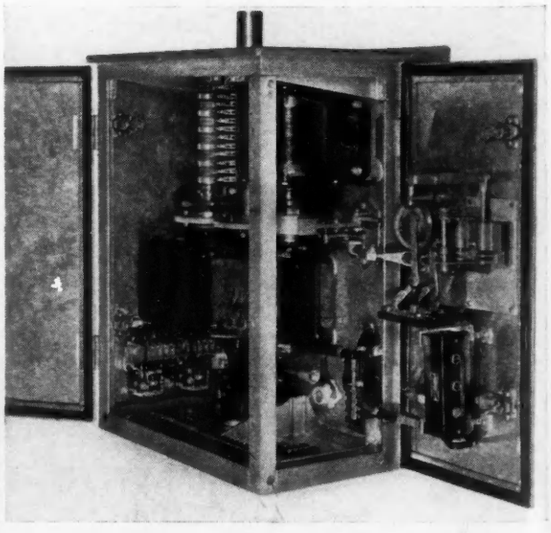
The small helical springs at the forward end of the contact bars are adjusted to provide the proper wiping pressure when the blade is in motion.

A second modification is an ingenious linkage on the operating-mechanism housing. This transmits a rotary motion and serves to keep the Corey interlock, part of which is mounted on the housing door, in operation regardless of door position.



ONE OF THE 287.5-kv. switches assembled for test at the factory

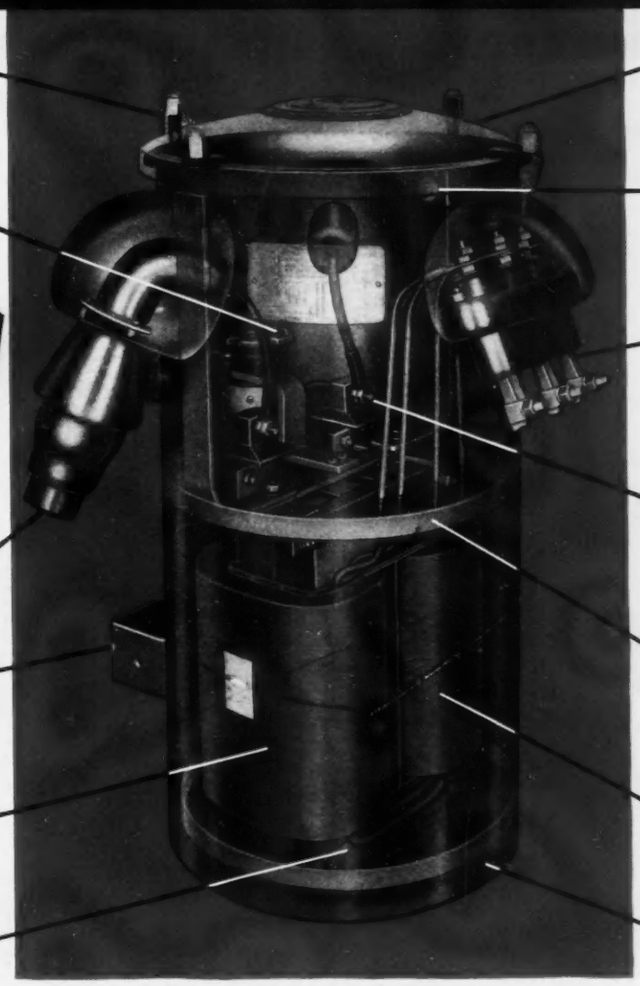




CONTACT END of the blade, viewed from above when closed with upper half of housing removed (left). Operating mechanism housing with doors open. New linkage is at right, midway along hinged edge of door (right)

Only Moloney Transformers

PROVIDE *all* OF THESE FEATURES



Brass cap nuts protect stud threads.

Ratio adjusters are supplied at no extra cost, on transformers on which taps are standard.

Solderless connector type high voltage bushings available up to 15,000 volts.

Insulating caps provided at no additional cost.

Hanger bracket permits mounting directly to pole. No hanger irons or special plates are required.

"Surge-Proven" core-and-coil unit reduces outages resulting from surges.

Fabricated steel core clamping structure.

Pressed steel cover of heavy gauge stock.

Core-and-coil unit anchored to tank above oil level.

Positive-grip solderless connectors of high tensile strength copper alloy. Neutral is gapped to ground.

Disconnects are provided in the high voltage leads to permit easy removal of bushings or core-and-coil unit.

Circular steel band protects leads and ratio adjustor, and centers unit in tank.

Core type construction permits easy replacement of coils.

Transformer is shipped filled with proper quantity of oil.

Write for Bulletin D-390222

Real Value for Your Transformer Dollar

On no other transformer will you find so many features. Compare Moloney transformers with those of any other manufacture. Compare them feature for feature . . . compare their operating records. You'll discover that you get more value for your transformer dollar when you buy Moloney transformers.

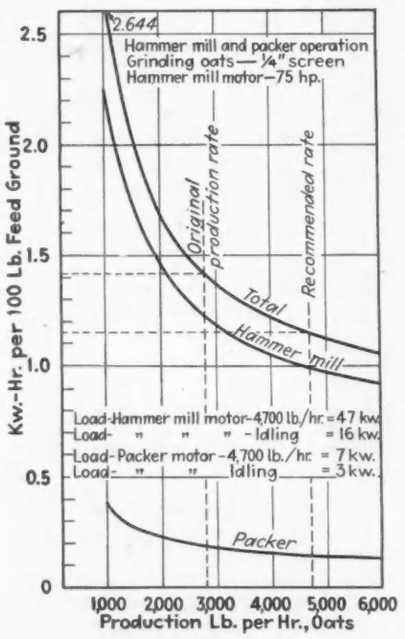
MOLONEY ELECTRIC CO.
ST. LOUIS MISSOURI

LOAD BUILDING

Ammeter Cuts Costs For Tulsa Feed Mill

By CHARLES A. BRADFORD
Industrial Engineer
Public Service Company of Oklahoma, Tulsa

Further proof, if indeed further proof is needed, that electrical instruments used to guide the loading of industrial equipment pay dividends in increased output and more efficient operation comes from one of our customers, a Tulsa miller. This customer, who formerly loaded his feed-grinding hammer mill "by ear," installed an ammeter in the mill motor circuit and found that he could safely boost production from 2,800 to 4,700 lb. of feed per hour, at the same time lopping 0.2 kw.-hr. from the energy consumption rate per 100 lb. of feed.



AMMETER LOADING of hammer mill motor boosts production, cuts unit energy consumption

The hammer mill used by the Shannon Feed Company, Tulsa, in grinding different kinds of grain into livestock feeds is belt-connected to a 75-hp. squirrel-cage induction motor. Tests with an Esterline recording wattmeter made shortly after the mill was installed, and which arose out of a complaint of high power costs, showed that the power required to operate the hammer mill with no feed being ground was 1.6 kw., and that under usual operating conditions, with the mill and motor being loaded "by ear," motor input was about 3.2 kw. Obviously, only half the total load was being used to process feed.

Investigation showed that this corresponded to about 2,800 lb. of oats per hour. Subsequent tests, which determined the kilowatt input to the motor at different rates of flow of grain to the mill, led to the accurate determination of the most economical loading as 4,700 lb. per hour.

The accompanying curve clearly shows the reduction in kilowatt-hours required per 100 lb. of feed processed as the rate of flow of feed to the mill is increased. Our tests showed that it is impractical, even for an old-time experienced miller, to determine by ear the proper loading of a hammer mill. Therefore, we installed an indicating ammeter in the circuit supplying the mill motor in such a way that it can be seen by the man controlling the flow of grain to the mill. It is now possible for the operator to load the motor in the most economical manner.

From our study we were able to show the customer the advantages of operating the mill as nearly as possible at its full capacity, and in making the increase in the amount of feed ground per hour from 2,800 to 4,700 lb. a saving of 0.2 kw.-hr. per 100 lb. of feed ground was made. The customer's power bill was greatly reduced.

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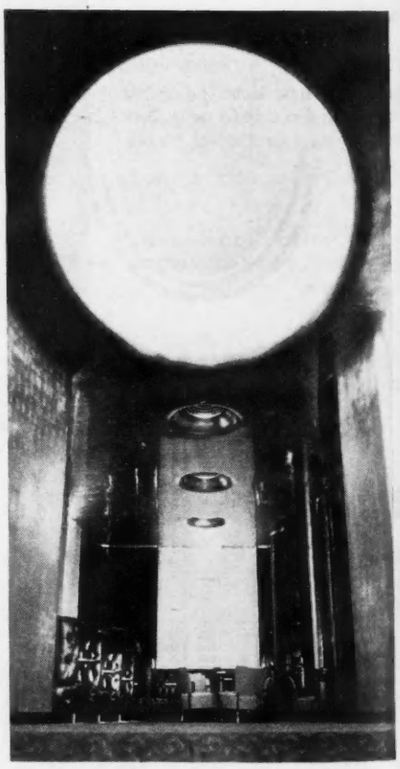
Lucite Used for Luminous Ceiling

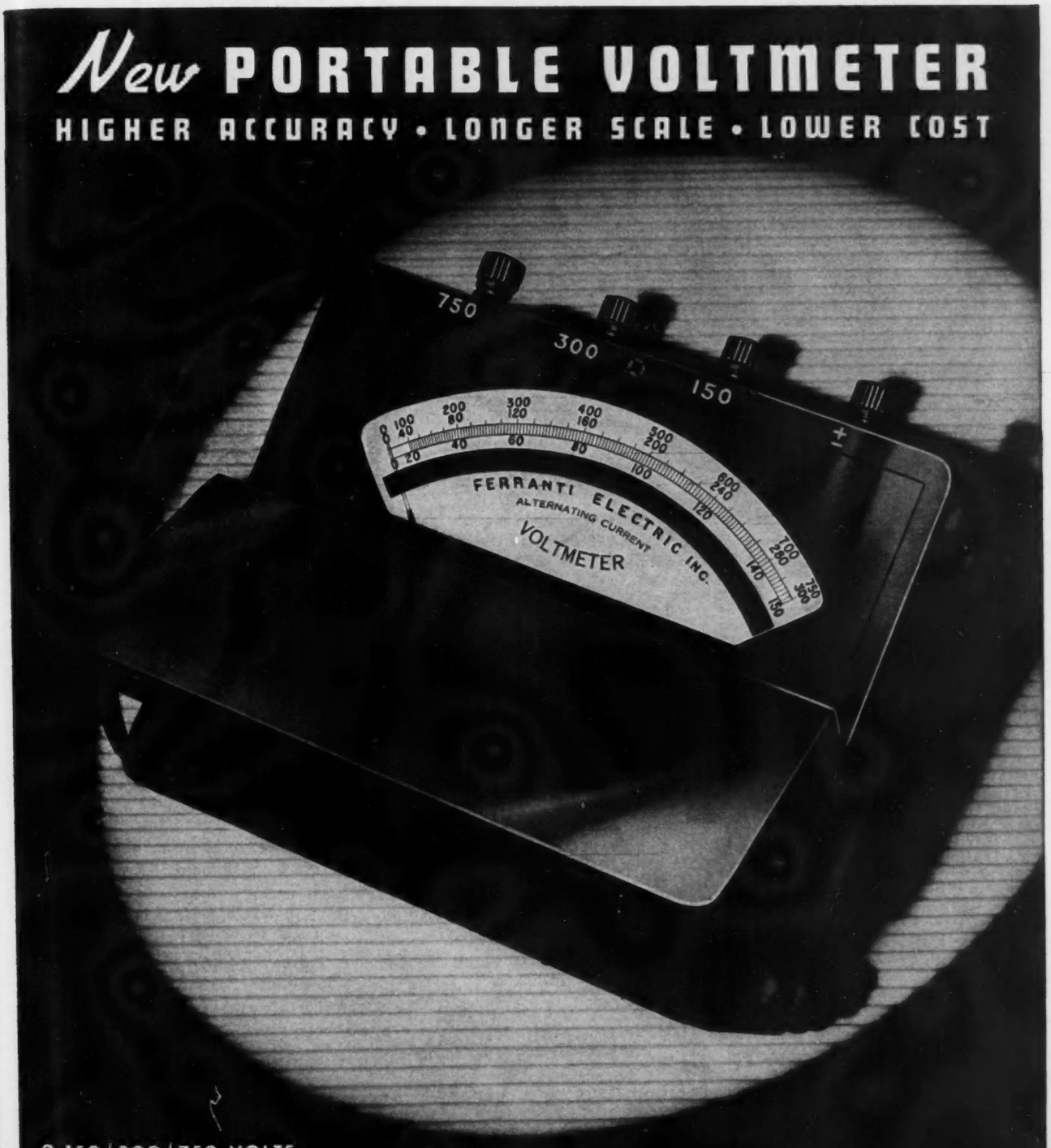
A lucite ceiling which serves to illuminate the cocktail lounge at St. Francis Hotel, San Francisco, is paying off its cost by bringing in more business. First of its kind, it is part



CONTINUOUSLY changing color, the lucite ceiling at St. Francis Hotel's cocktail lounge, San Francisco, dominates the $100,000 modernization; 150 Westinghouse 200-watt floodlights are Thyratron controlled

New PORTABLE VOLTMETER

HIGHER ACCURACY • LONGER SCALE • LOWER COST



0-150 / 300 / 750 VOLTS

Accurate to ½ of 1% • Easily-read Hand-calibrated Mirror Scale, 5¼" long, with 150 divisions • High Torque-weight ratio • Magnetically shielded • Exceptionally well damped • Self-contained in compact dust and damp-proof case, with hinged cover and leather carrying handle • This new precision voltmeter offers outstanding value to all engineers interested in accurate measurements.

SEND AT ONCE FOR COMPLETE SPECIFICATIONS

FERRANTI ELECTRIC, INC. 30 Rockefeller Plaza New York, N. Y.

Ferranti Electric, Ltd., Toronto, Canada • Ferranti, Ltd., Hollinwood, England

ELECTRIC KITCHENS COOLER—Hartford Electric Light's home-made display promoting electric ranges reveals a 15-degree difference in tested kitchen temperatures in favor of cooking by wire as compared with other methods—a main office exhibit attracting much attention

of a $100,000 modernization of the cocktail lounge. Some $50,000 was spent for the lighting job, including the ceiling, which cost $20,000.

Timothy L. Pflueger, San Francisco architect, who was prominently identified with the San Francisco Fair, where lighting predominated, drew upon some of the ideas used for the first time there and thus created a new type of interior illumination. In effect, the entire ceiling serves as a lighting fixture.

Four circuits of lights run the spectrum of colors by means of thyratron control. Thus the ceiling constantly changes hue. Main features of the room itself, chosen to fit this varying color scheme, are black patent-leather walls, white silk drapes, turquoise carpet and chartreuse chairs.

Basis of the illumination is a false ceiling above the lucite. The false ceiling is finished in rough white plaster, painted white. Below this is a 3-ft. ledge, running around the four walls. The ledge serves to conceal and support the floodlights which illuminate the false ceiling.

The floodlights are Westinghouse No. 810, narrow-beam, equipped with 200-watt incandescent lamps and color lenses. The beams are centered beyond the center-line of the false ceiling and thus crisscross. The room is not strictly rectangular, but is roughly 30x50 ft. The floodlights are on approximate 12-in. centers and 150 units are employed.

The lucite ceiling is not in one plane. However, it is at distances up to 3 ft. below the false ceiling and is suspended by metal bars. The ceiling was fabricated by Dave Swedlow of Hollywood, according to Pflueger's drawings. Lucite sheets, furnished by Dupont, measuring 36x48 in. by ¼-in. thick, were cut and die-pressed, then welded together in sections of various sizes. These sections are removable for lamp replacement.

As one progresses along the line of floodlights, the color filters rotate through blue, green, red and amber, each corresponding to a circuit. White is attained by combination of the four colors, but is not normally used. The thyratron control ordinarily produces a color cycle in seven minutes, but a manual remote-control position is provided at the bar, so that the bartender can produce whatever lighting he desires.

Connected load, including lighting in entrance halls, etc., is 35 kw., but average demand when operating is something over half this by reason of thyratron control.

•

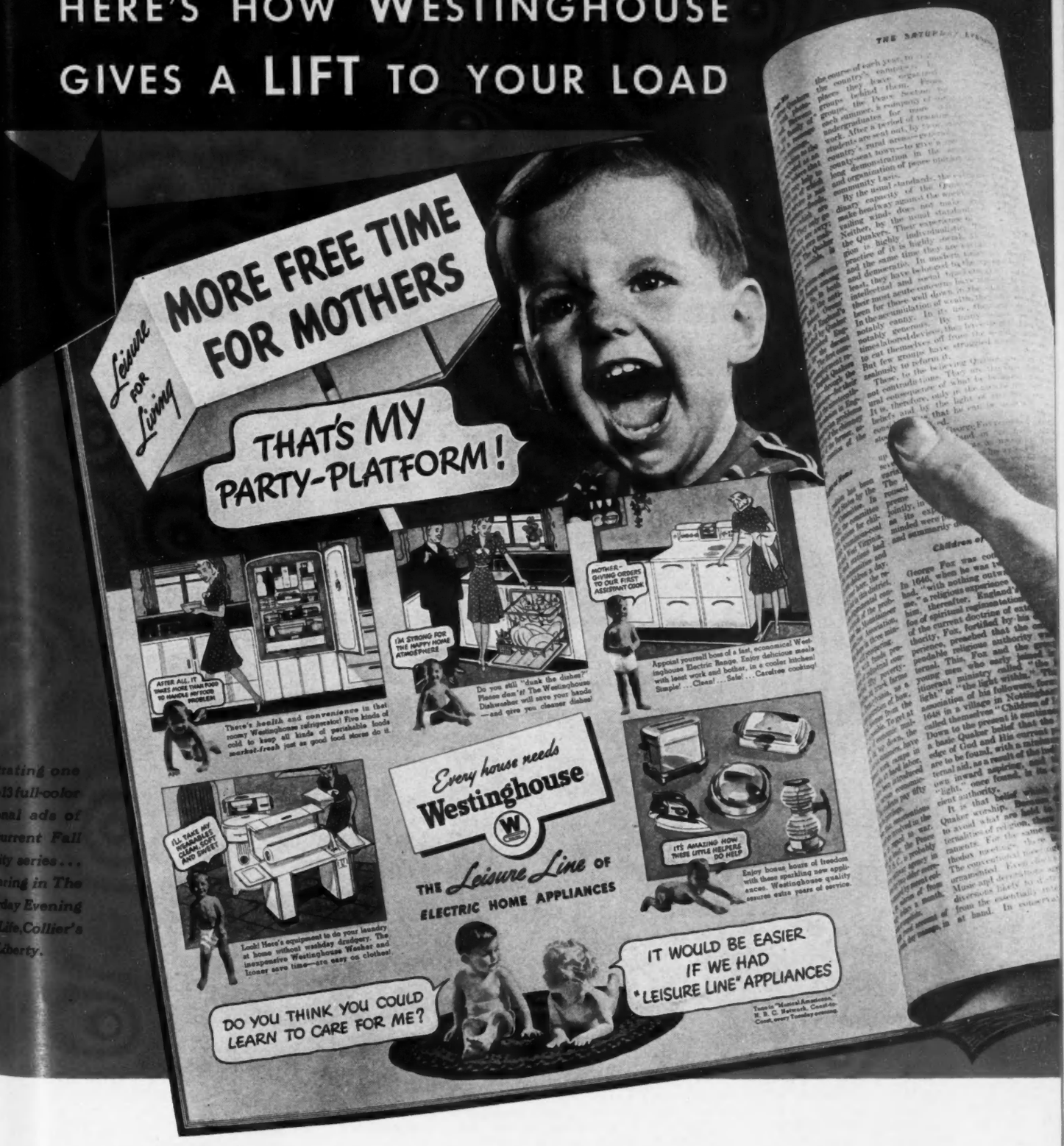
Fluorescents Fitted to Office Lighting

In the sales promotion building of the General Electric Co., Nela Park Cleveland, the lighting problem was to provide 50 ft.-candles of good quality office illumination on the desk top using fluorescent lamps and existing wiring. The room is 14½ by 17 ft. with an 11½-ft. ceiling, with four outlets having a wired capacity of 300 watts per outlet. The walls are stippled brown with a reflection factor of 40 per cent; ceiling is flat white with a reflection factor of 80 per cent.

This lighting problem was solved by using six suspended indirect-direct "Brigadier" units manufactured by the F. W. Wakefield Brass Company. Each unit contains four 48-in. daylight fluorescent Mazda lamps operated on Tu-lamp ballasts with corrected power factor. The stroboscopic effect is practically eliminated.

DAYLIGHT FLUORESCENTS provide 50 ft.-candles on the desk tops and were adapted to the existing wiring in this sales office

HERE'S HOW WESTINGHOUSE GIVES A LIFT TO YOUR LOAD


Leisure for Living
MORE FREE TIME FOR MOTHERS
THAT'S MY PARTY-PLATFORM!
AFTER ALL, IT TAKES MORE THAN FOOD TO HANDLE MY FOOD PROBLEM
There's health and convenience in that roomy Westinghouse refrigerator! Five kinds of cold to keep all kinds of perishable foods market-fresh just as good food stores do it.
I'M STRONG FOR THE HAPPY HOME ATMOSPHERE
Do you still "dunk the dishes?" Please don't! The Westinghouse Dishwasher will save your hands—and give you cleaner dishes!
MOTHER-GIVING ORDERS TO OUR FIRST ASSISTANT COOK
Appoint yourself boss of a fast, economical Westinghouse Electric Range. Enjoy delicious meals with least work and bother, in a cooler kitchen! Simple! ... Clean! ... Safe! ... Carefree cooking!
I'LL TAKE MY WASHABLES CHARMLESS AND SWEET
Look! Here's equipment to do your laundry at home without washday drudgery. The inexpensive Westinghouse Washer and Ironer save time—are easy on clothes!
Every house needs Westinghouse
THE Leisure Line OF ELECTRIC HOME APPLIANCES
IT'S AMAZING HOW THESE LITTLE HELPERS DO HELP
Enjoy bonus hours of freedom with these sparkling new appliances. Westinghouse quality assures extra years of service.
DO YOU THINK YOU COULD LEARN TO CARE FOR ME?
IT WOULD BE EASIER IF WE HAD "LEISURE LINE" APPLIANCES
Tune in "Musical Americana," N. B. C. Network, Coast-to-Coast, every Tuesday evening.

By dramatically directing attention to the leisure-living potentials of electric appliances, Westinghouse increases product purchases. Increased use of appliances helps to boost your load to a profitable peak.

Westinghouse programs thus benefit: *The Consumer*—by dramatizing the Leisure Line of Electric Home Appliances. *The Retailer*—by directing traffic to his store. *The Utility*—by pushing load-building products.

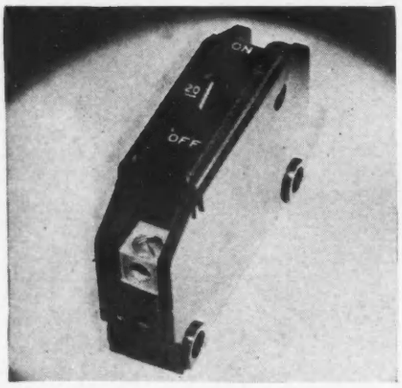
Westinghouse merchandising projects will continue to function on this 3-fold, co-operative basis.

Westinghouse THE *Leisure Line* OF *ELECTRIC* HOME APPLIANCES

NEW EQUIPMENT

Small Circuit Breaker

Designed primarily for the protection of lighting, appliance and motor circuits in homes, buildings, stores and factories, this new circuit breaker is said to combine for the first time in a single unit a cooperative magnetic and a thermal trip. Combination is devised to provide the advantage of instantaneous trip on short circuits with the added advantage of time-delay for momentary overloads.

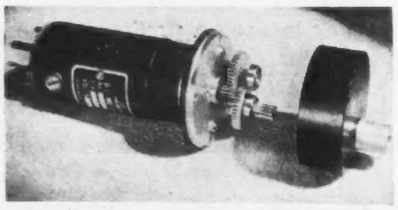


"Quicklag" breaker; 15 to 35 amp., single-pole, 250 volts a.c., 125 volts d.c. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

•

Motor Control

Motor-driven system for general application, in which the driven member is abruptly stopped or started in response to an electric current or control signal, is a recent development and incorporates an electromagnetic clutch with the motor. Mechanical combination of low-inertia multi-magnetically coupled driven clutch plate with axial spring, braking shoe and reduction gearing is said to effect uncoupling of the driven member practically instantaneously with the de-energizing of the clutch.

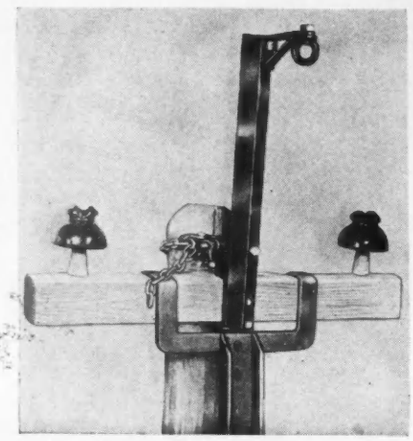


Fractional-hp. d.c. motor with electromagnetic clutch. **Lear Avia, Inc.**, Dayton, Ohio.

•

Transformer Gin

While this new type transformer gin weighs only 14 lb., it is strong enough to hoist a 37½-kva. transformer, say the makers, adding that it has been successfully tested at 2,000 lb. and is rated to lift 1,350 lb. Light weight of device makes for ease in lifting it and mounting it in place; chain attachment adjusts it to any size pole. It can be mounted either on the pole or over a crossarm by changing the position of fittings with a set-screw adjustment. Welded steel chain is fastened around the pole by a hand screw. Swivel ring at top of gin allows the rope block to turn at any angle, avoiding binding.



Transformer gin. **A. B. Chance Co., Utilities Division**, Centralia, Mo.

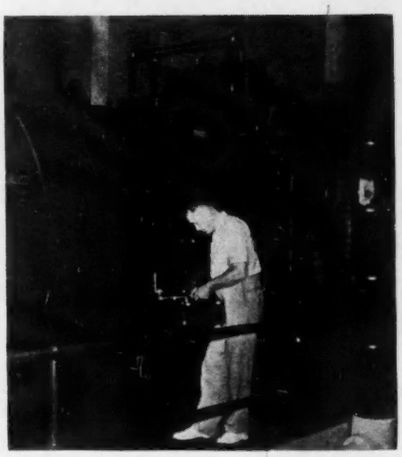
Who Makes What?

"Electrical Buyers Reference," published annually. **Electrical World**, 330 West 42d St., New York, N. Y.

Names, addresses and products of electrical manufacturers are catalogued in this convenient, annual publication for public utility, industrial, engineering and other major electrical buying interests.

Sound-Level Meter

This new lightweight sound-level meter has a range of 24 to 120 decibels. Essential parts of the device are a microphone, a five-stage, resistance-coupled amplifier and an indicating instrument. Vibration velocity unit may be substituted for the microphone, providing a means of measuring vibration as well as noise.



Measuring noise of steam turbines with new 19-lb. sound-level meter. **General Electric Co.**, Schenectady, N. Y.

•

Tool Trailer

One-piece lid on this hot line tool trailer, raised and lowered by a crank-operated mechanism from the outside of the trailer, is designed to keep the unit dust- and

Hot line tool trailer; 156 in. long, 44 in. wide and 24 in. deep. **James R. Kearney Corp.**, St. Louis, Mo.

THE NEW MODE IN STREET LIGHTING BRACKETS

GREATER ROAD CLEARANCE
ON SAME SIZE POLES

DRAINAGE AWAY FROM LAMP

MORE LIGHT AREA FOR SAME
MOUNTING DISTANCE FROM GROUND
DUE TO INCREASED HEIGHT OF LAMP

ENABLES USE OF SHORTER POLE WITHOUT
LESSENING LAMP HEIGHT

ONE SCREW, ORNAMENTAL PENDANT,
ALIGNMENT SETTING ALLOWS QUICK
ADJUSTMENT OF LAMP TO LEVEL POSITION

CAN BE OBTAINED WITH POLE PLATES FOR
WOOD OR STEEL POLES WITH INTERNAL OR
EXTERNAL WIRING

FOUR—SIX—EIGHT—TEN FEET EXTENSIONS.
1¼—1½—2-INCH PIPE

HUBBARD AND COMPANY
PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

INSULATING VARNISHES

for every electrical need

For thirty-five years IRVINGTON has not only manufactured insulating varnishes, but has used them in the manufacture of varnished insulation.

Combined with this first-hand knowledge of the various requirements demanded of the finest insulating varnishes, are constant and thorough research and testing of raw materials and finished product in extensive laboratories maintained for this purpose alone.

IRVINGTON and HARVEL Insulating Varnishes are manufactured in a variety of types and characteristics to fulfil the different requirements and specific purposes of the electrical field. Their development is the result of years of experience in meeting demands for insulating varnishes of the highest quality for dipping, brushing, spraying, vacuum and pressure applications.

IRVINGTON Varnishes are of the oxidizing type containing drying oils; HARVEL 512-C and 612-C Baking Varnishes are of the resin type, solidifying throughout by chemical polyonerization and condensation. In the IRVINGTON line are Clear and Black Baking Varnishes; Clear and Black Air Drying Varnishes; Black Insulating Paint; Black Air Drying, Baking and Flashing Core Plate Varnishes! Clear and Black Oilproof Finishing Varnishes; Clear Sticking Varnish; Red Oilproof Enamels, Gray and Black Machinery Enamels. In the HARVEL line are Baking and Air Drying Varnishes.

Complete data on the various IRVINGTON and HARVEL insulating materials will be sent upon request—or, we will gladly solve any special insulating problems submitted.

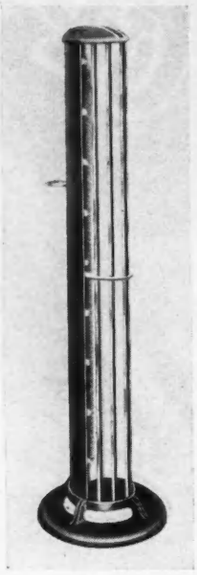
OTHER IRVINGTON ELECTRICAL INSULATIONS

Varnished Cambric Cable-Cloth.
Varnished Cambric for general insulation.
Varnished Fibreglas.
Varnished Duck.
Varnished Silk.
Varnished Paper.
HARVEL Protective Paints, Coatings and Finishing Enamels.
HARVEL, Oil Stop.
IRV-O-VOLT Varnished Inside-and-out Tubing and Sleeving.
IRV-O-LITE Extruded Plastic Insulating Tubing.
IRV-O-SLOT Composite Slot Insulation.
CARDOLITE Coil Sealing Insulation.

IRVINGTON VARNISH & INSULATOR CO.
IRVINGTON, NEW JERSEY, U. S. A.
PLANTS AT IRVINGTON, N. J. and HAMILTON, CANADA
Representatives in 20 Principal Cities

water-tight. Standard equipment includes tail light, two rear reflectors, and an eye-type hitch, with an electric heater, to be plugged into a light circuit for drying tools, available as an extra.

•



Electric Heaters

Long, narrow design and small base of this electric heater, one in the company's new line, recommends it for use in bathroom, nursery or wherever space is limited, to provide head-to-heels warmth.

"Seven-Leaguer" heater; "Heat Fan" and "Spred Ray" not shown. **Thermador Electrical Mfg. Co.**, Los Angeles, Calif.

•

Cable Splicer

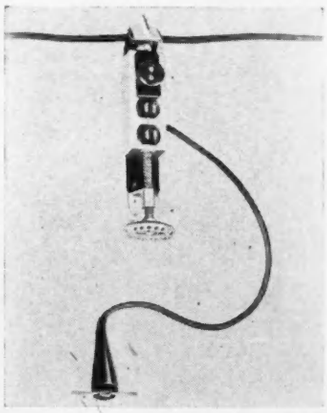
"Velocity Power" cable splicer; for splicing single-conductor, duplex or concentric mining machine cables in sizes from No. 2/0 to No. 6. **Mine Safety Appliances Co.**, Pittsburgh, Pa.

Weighing 6 lb., this cable splicer is operated by a cartridge discharge, compressing a copper sleeve tightly about the two butted ends of a broken cable to give a splice of small diameter that allows application of full insulation. Short connection is said not to impair flexibility of cable and to give full current-carrying capacity and high percentage of mechanical strength.

•

Tap-Off Receptacle

Power for lights and electric lead pots is made quickly available in manholes and other out-of-the-way spots with this



Emergency tap-off receptacle; two points of access to 110-volt service; device fused for 30 amp. weight, about 2 lb. **Line Material Co.**, Milwaukee, Wis.

WAGNER *Type* HEX TRANSFORMERS

give efficient, dependable, uninterrupted service!

Wagner Type HEX distribution transformers, like all Wagner transformers, are built to give efficient, dependable, uninterrupted service. The HEX transformer is new in design, but it back of it nearly fifty years of transformer engineering and manufacturing experience. This wealth of experience is reflected in the performance of Wagner HEX transformers. Their high efficiency and remarkable stamina is the result of constant improvement in design and construction:—

BUSHING POCKET:—One-piece copper-bearing steel bushing pocket electrically welded to the tank provides protection to the high-voltage bushings.

COORDINATED BUSHINGS:—The insulation level of the bushings and windings are so coordinated as to cause abnormal line surges to flash over the bushings on the outside of the tank.

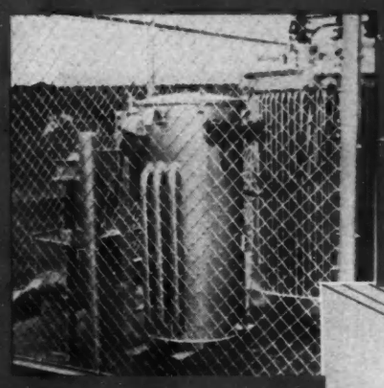
WINDINGS:—Windings are carefully treated to give added mechanical strength and protection to the coils, facilitate the dissipation of heat and strengthen the insulation. All windings have reinforced end-turn insulation.

CORE:—Core is made of the highest grade of non-aging silicon steel laminations that have been carefully sheared with the grain and then electrically annealed to obtain minimum core loss.

Wagner experience is not limited to one type of transformer. Wagner manufactures a complete line of distribution transformers—single or three-phase, rural-line and air-cooled. Also power transformers in all sizes and voltages.

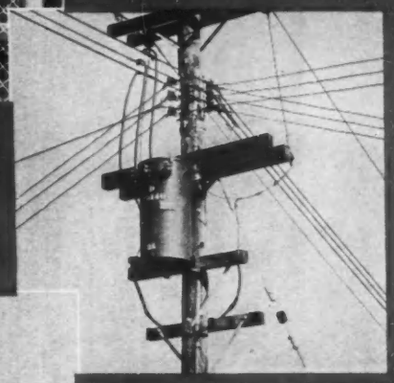
Wagner Type HEX Distribution Transformer—Rated 3-kva.

T60-12

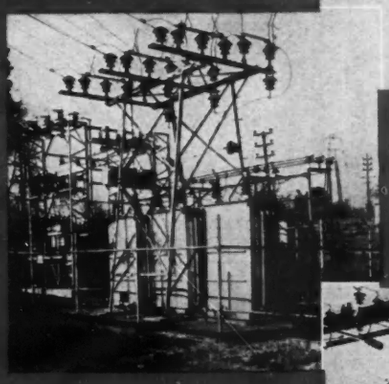


Wagner 50-kva HEX Transformer installed in a mid-western oil refinery.

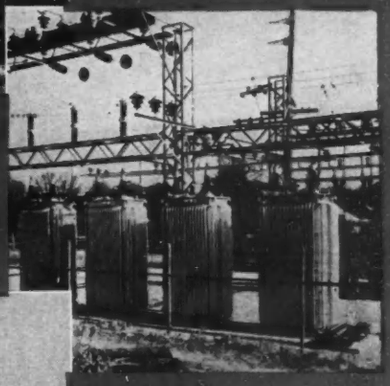
Wagner 25-kva HEX Transformer mounted on pole in a mid-western town.



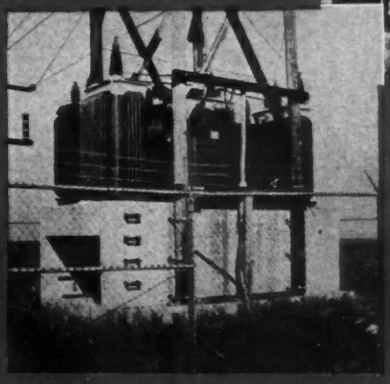
Wagner 333-kva sub-station transformers serving a southern municipality.



Wagner 500-kva transformers in a sub-station in the south.



Wagner 500-kva transformers serving a large industrial plant.



Send for FREE Bulletins

A factory-trained sales engineer will be glad to work with you on any of your transformer needs. In the meantime write for bulletins TU-180 (Distribution) and TU-181 (Power) describing Wagner transformers.

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS • BRAKES • FANS • MOTORS

"I FIGURED WE SAVED ABOUT $2000.00 BY INSTALLING BUSS Super-Lag FUSES."
BUSS Super-Lag

..So says; C. J. COX, Electrical Engineer, Deerfield Packing Corp., Bridgeton, N. J.

"Some time ago the question arose as to what to do on main distribution panels we were going to install.

"After careful consideration we decided to install panels with BUSS Super-Lag fuses. We felt that they would give us better protection at lower maintenance cost.

"I figure we saved about $2,000.00 by installing BUSS Super-Lag Fuses and our cost of maintenance has proved to be the lowest we ever experienced."

You too, can save money by installing BUSS fuses

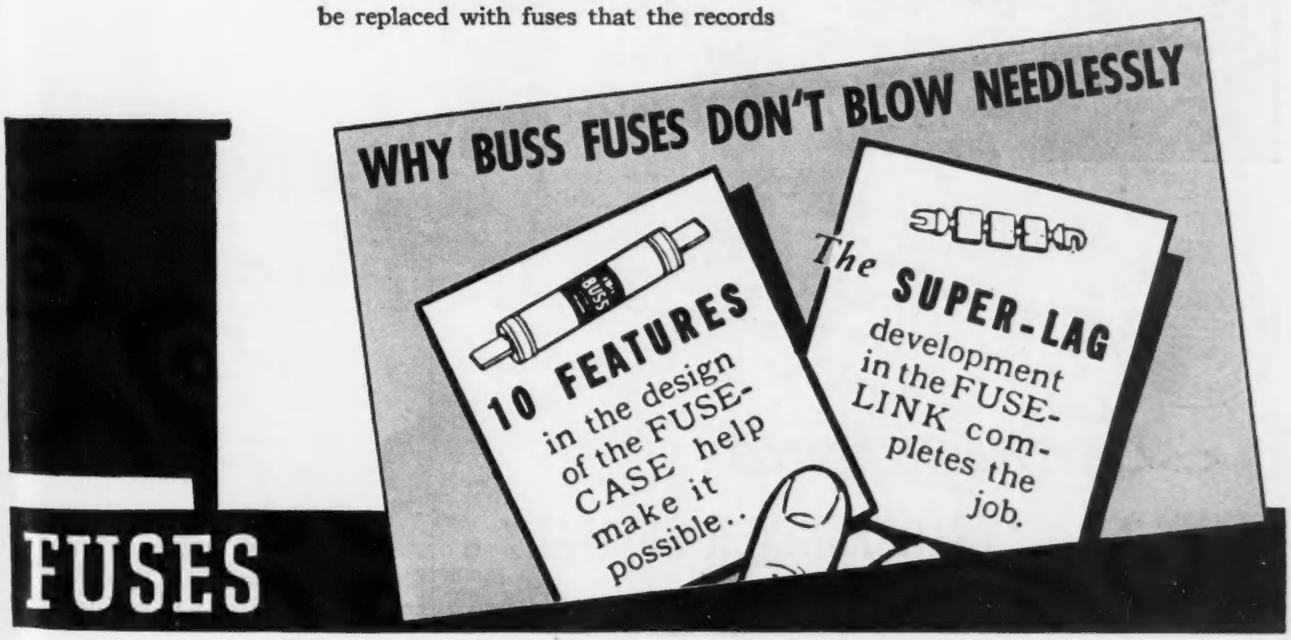
It is no accident that BUSS Super-Lag fuses provide safest electrical protection at the lowest maintenance cost.

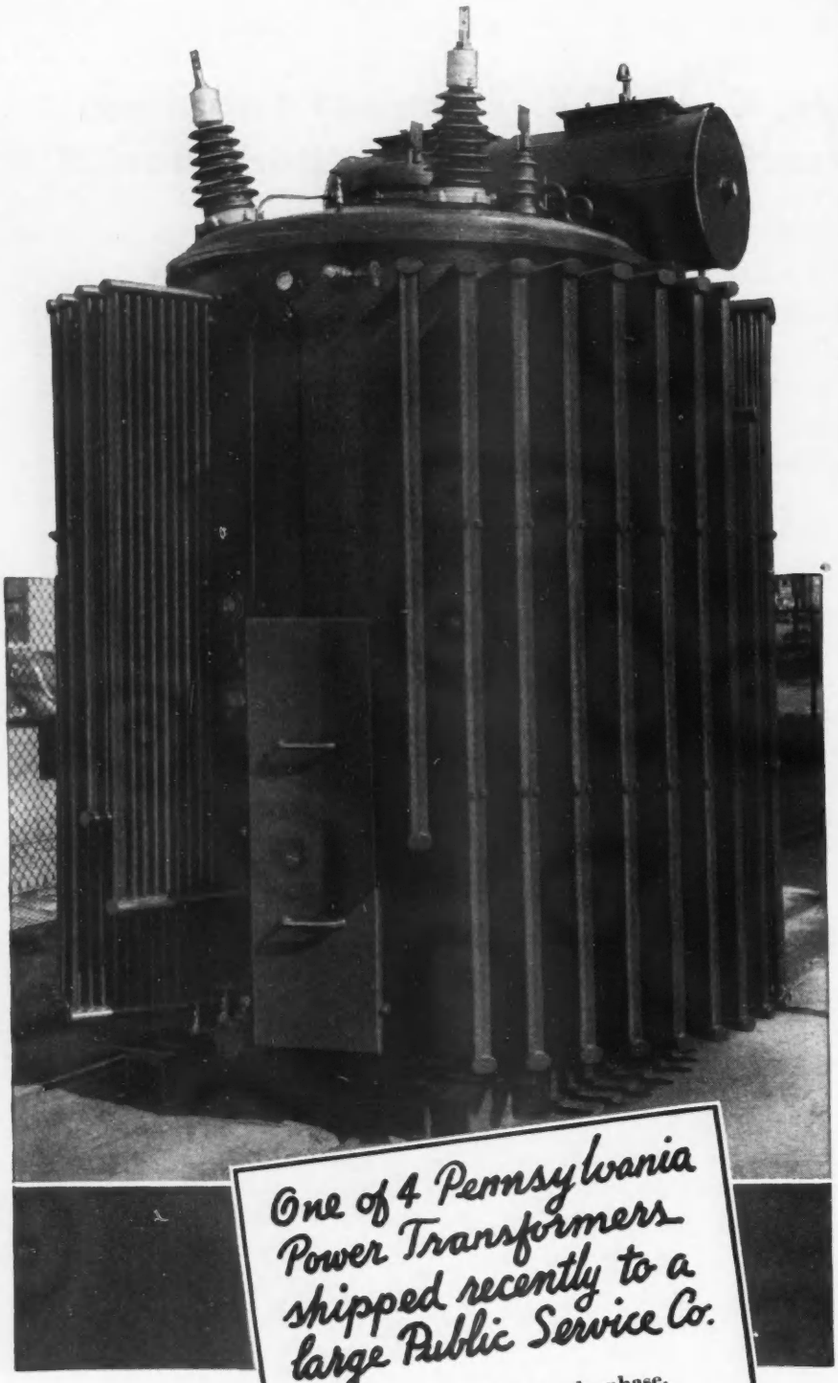
In the first place the BUSS Fuse-Case is so designed that it practically eliminates any chance of the fuse being tricked into a needless blow through faulty renewal—or through the development of poor contact within the fuse. Thus the BUSS Fuse-Case gets around a source of trouble and expense common to most other renewable fuses.

Secondly, the Super-Lag development in the BUSS Fuse-Link gives BUSS fuses a long time-lag that keeps them from popping open on every motor starting current or other harmless overload. This means a material reduction in costly shutdowns so often incurred when ordinary fuses blow on temporary overloads such as are caused by machines stalling momentarily or two or more motors starting simultaneously and the like.

How to actually GET this money saving in your plant

Simply make a memo right now while it is on your mind, to see to it that all stock and purchase records are changed to call for BUSS Super-Lag fuses. Then as old fuses blow they will automatically be replaced with fuses that the records of thousands of plants show to be the lowest cost, most troubleproof renewable fuses on the market. Bussmann Mfg. Co., St. Louis, Division of McGraw Electric Company.


WHY BUSS FUSES DON'T BLOW NEEDLESSLY
10 FEATURES in the design of the FUSE-CASE help make it possible..
The SUPER-LAG development in the FUSE-LINK completes the job.
FUSES



One of 4 Pennsylvania Power Transformers shipped recently to a large Public Service Co.

8333 kva, 36 kv, single phase.

Equipped with standard Pennsylvania Uni-Row Radiators and Straight-Line Tap Changers. Subjected to impulse, temperature run and other A.I.E.E. tests.

TOMORROW'S TREND TODAY IN TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

1701 ISLAND AVENUE, N. S., PITTSBURGH, PA.

new emergency tap-off receptacle. Adjustable serrated clamp of device is first attached to the ground, contact point is then screwed into position, piercing the rubber insulation and making contact with the secondary wire. After the receptacle has been used and removed, pierced section of insulation is taped up.

•

V-Belt

Static-discharging V-belt. **The B. F. Goodrich Co.**, Akron, Ohio.

A V-belt which is stated to prevent the accumulation of static and to retain its static-discharging qualities during its entire life is offered by this company to machine or equipment-makers only, for the present. Resistance built into the belt is just enough so that the belt itself cannot act as a direct passage for current, according to the manufacturer.

•

Capacitor Motor

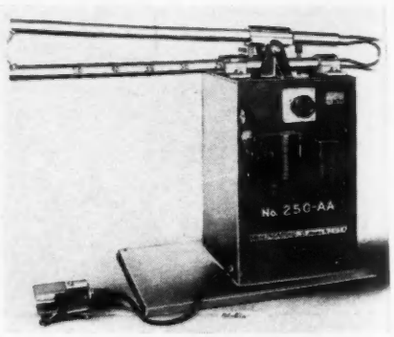
Type "CJ" integral horsepower motor; ¾ to 3 hp. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

To eliminate added mounting and wiring costs, this integral horsepower high-torque capacitor motor has the necessary capacitors and centrifugal switch mounted within the motor brackets. Bearings and dual voltage leads are standard, and entire unit is of "protected" type of design.

•

Spot Welder

Both upper and lower horns of this spot welder can be lengthened or shortened to meet the requirements of the size and type of work, making it possible to weld light



Long-horn spot welder "No. 250-AA"; sizes, 5 to 25 kva., 25 to 50 kva. (illustrated), 40 to 75 kva. **Eisler Engineering Co., Inc.**, Newark, N. Y.

or heavy work and deep metal parts. Markings on the horn represent the kva. ratings. Cooling water goes through the entire horn. Welding speeds vary from 30 to 150 spots per minute.

•

Insulating Varnish

"Harvel 612C" insulating varnish. **Irvington Varnish & Insulator Co.**, Irvington, N. J.

Compounded from processed cashew nut shell liquid, with no added gums or asphaltic materials, this insulating varnish is stated to be water- acid- and alkali-

resistant, to penetrate thoroughly, to be non-corrosive and to provide complete bonding. Setting of varnish is produced by internal chemical change brought about by elevated temperatures rather than by oxidation. Oil-proofness is an added feature claimed for the product. Average dielectric strength of dried film of varnish is 1,600 to 1,700 volts per mil; dielectric strength after 24-hour immersion in water is 550 to 600 volts per mil.

•

Portable Lamp

Use by utilities as an emergency standby light is a potential application for this

Portable battery lantern. **Burgess Laboratories,** Chicago, Ill.

new portable battery lantern, said to have 180,000 maximum beam candle-power. Output at 100 ft. is estimated at 18 ft.-candles.

•

Heating Element

"Glasohm" immersion-type heating element; ¼ in. in diameter, available in various lengths. **Clarostat Mfg. Co., Inc.,** Brooklyn, N. Y.

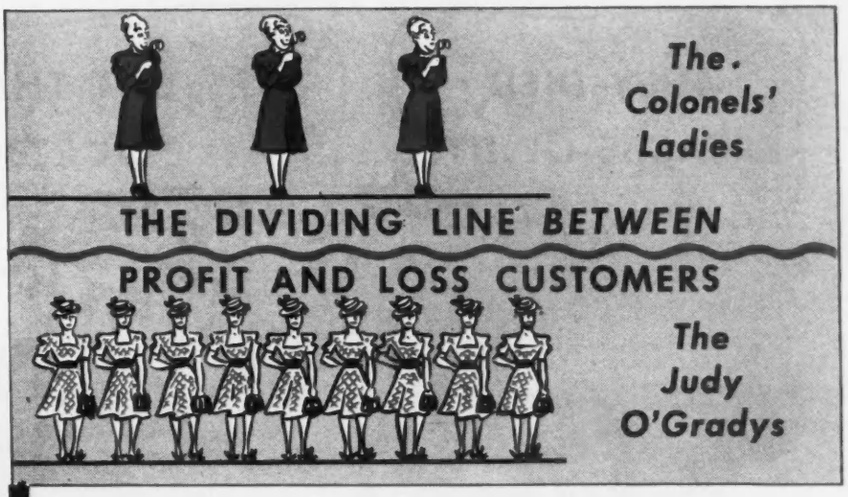
Flexible armored heating element for immersion applications comprises a fibre-glass core for the resistance-wire winding, covered by a fibre-glass braiding and then incased in a seamless metal tube. It will operate at temperatures to 1,000 deg. F.; resistance-to-ground insulation is said to be high even at full operating temperature. It can be used without metal sheath for non-immersion applications.

•

TECHNICAL LITERATURE

BUILDING WIRE—New types of building wire recognized by the 1940 National Electrical Code and what this recognition means is a feature of a new book on small-diameter wire, including synthetic, available on request to National Electric Products Corp., Pittsburgh, Pa.

PROTECTIVE LIGHTING—The problem of providing adequate lighting for the protection of industrial plants against sabotage and entrance by unauthorized persons is treated in a 13-page bulletin, recently revised by the Holophane Company, Inc., 342 Madison Avenue, New York City. This booklet also discusses lighting for night production, and contains many diagrams and illustrations, showing applications and results of tests conducted. Holophane units, useful in protective lighting, are described in detail, and instance of their application are given.



How Many of your Customers Are You Serving Without Profit?

There is a "Dividing Line Figure." Chances are it costs something like an average of $1.50 a month to serve each of your lighting customers. That large group of customers whose monthly bills are under $1.50 is one of the big problems.

Here's One Sure Method to Make Them Profitable

Electromaster can help a Utility to place low-priced ranges with its low-bill customers. The program works directly and immediately to increase domestic load —where it is needed most! . . . Skeptical? Well, why not send the coupon?

(For Electric Utility Executives Only, Please)

ELECTROMASTER, INC., 1803 E. Atwater St., Detroit, Michigan

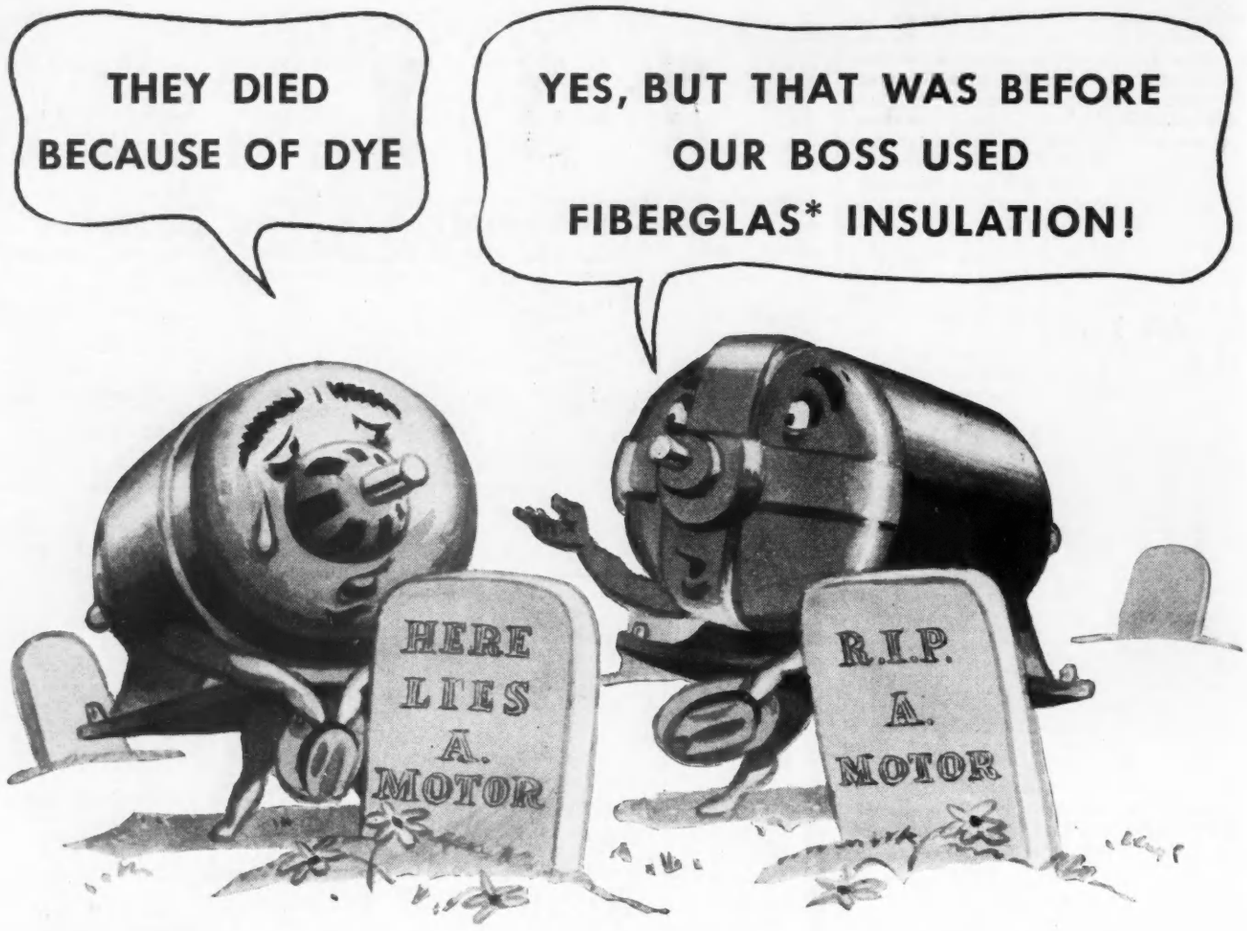
Yes, we'd like to look over this plan—particularly your proofs that it works. This request puts us under no obligation.

Utility .....

By .....

Title .....

Address .....



Fiberglas cut dye-room maintenance costs, increased motor life 5 times

THIS IS A STORY of incredible maintenance savings you yourself may make with Fiberglas insulation . . .

A certain company in the textile field had 20 overloaded motors working in their dyeing room. The motors were continually bathed in sulphuric acid fumes, steam, acetic acid, soda ash, and aniline dye.

The average length of motor life before rewinding—was just an expensive six months.

Then someone told them about Fiberglas.

The first of the 20 motors were Fiberglas-insulated 2½ years ago. The last were insulated 16 months ago. *And not a single motor has failed!* Imagine it! An increase of *five times* in insulation life! Not one penny lost in downtime from motor failures for 2½ years!

But this is not an unusual success story. It is happening every day. It may well happen to you.

Why Does Fiberglas Last Longer?

It lasts longer because it is a *better* insulation . . . because it is glass in fibrous form; the individual glass fibers are non-hygroscopic, and higher in resistance to most chemicals than *any other* insulation. No acid destroys Fiberglas, except Hydrofluoric.

How Does Fiberglas Come?

It comes in any form you need for electrical insulation. It is combined with mica, plastics, or varnishes to make slot insulation, laminated materials, and varnished cambric and tubing.

It is served on magnet wire.

It is fabricated into tapes, braids, and tying cords.

And although Fiberglas insulation occupies little space . . . it is so efficient that in a number of cases it has permitted a saving of *both* weight and size in motors *without* lowering their H.P.

Your Next Step

First, send for Fiberglas Engineering Data. Then install Fiberglas in the motor on the toughest job in your shop. From that moment on, you can expect to begin saving your company real money . . . and yourself a lot of needless maintenance trouble. Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada: Fiberglas Canada, Limited, Oshawa, Ontario.

OWENS-CORNING

FIBERGLAS*

*T. M. Reg. U. S. Pat. Off.

TOLEDO, OHIO

SPECIFY FIBERGLAS ELECTRICAL INSULATION

MANUFACTURING - MARKETS

Westinghouse Orders Booked Gained 70%

The board of directors of the Westinghouse Electric & Manufacturing Co., meeting in Mansfield, Ohio, this week, declared a dividend of $1 per share on the common stock and $1 per share on the preferred stock of the company payable November 30 to stockholders of record November 8. A. W. Robertson, chairman, reported that net income for the first nine months of this year was $14,583,328, compared with $9,069,811 for the similar period of 1939, an increase of 61 per cent.

Orders booked for the nine months were $261,535,733, compared with $153,976,777 for the same period in 1939, an increase of 70 per cent. For the twelve months ended September 30 orders were $321,798,000, compared with $190,469,325 for the same period in 1939, an increase of 69 per cent.

Sales billed for the nine months were $174,998,003, compared with $129,602,676 for the same period in 1939, an increase of 35 per cent. Billings for the twelve months were $220,466,690, compared with $168,025,474 for the same 1939 period, an increase of 31 per cent.

Unfilled orders at September 30 were $151,665,857, compared with $58,337,790 at September 30, 1939, an increase of 160 per cent.

Following their meeting, the directors made an inspection of the merchandising division plant in Mansfield, which is now being considerably expanded to meet the demand for refrigerators, electric ranges, roasters, electric irons and other consumer products. They were greeted by Frank R. Kohnstamm, sales manager of the division, and L. E. Osborne, manager of manufacturing.

Mr. Kohnstamm stated that the anticipated increase in sales of all lines for the remainder of this year will continue well into 1941 due to greater consumer expansion in electrical household appliances. He pointed out that other factors, such as the new housing facilities provided by the National Defense Program and other federal housing activities, as well as the expected general improvement in employment, would contribute to increased sales.

•

New Cutler-Hammer Plant

Cutler-Hammer, Inc., announces the opening on October 1 of its new factory, warehouse and sales office at 711 Potrero Avenue, San Francisco, Calif. This new plant is a modern, one-story structure. Pacific Coast sales headquarters will also be located in the new building. F. H. Oberschmidt, manager of the San Francisco office, supervises the Seattle, Wash., and Portland, Ore., sales offices as well.

Allis-Chalmers Shows Net Gain in Quarter

Allis-Chalmers Manufacturing Co. reports for the third quarter a net income of $1,159,639, or 65 cents a share, on the common stock. This compares with net of $943,450, or 53 cents a share, in the same 1939 quarter, a gain of 22.9 per cent.

Billings totaled $22,846,714 and orders booked in the third quarter totaled $30,946,321. This compares with billings of $18,636,045 and orders of $19,710,020 in the 1939 third quarter.

For the first nine months net income was $3,769,397, or $2.12 a share, as against $2,643,873, or $1.49 a share, in the same 1939 period, a gain of 42.5 per cent. Billings for the nine months were $66,543,316, as against $57,014,052 in the 1939 period, a gain of 16.7 per cent. Orders booked totaled $78,530,846, against $64,938,367, a gain of 20.9 per cent.

HOUSE OF MAGIC—Visitors at the recent National Metal Exposition in Cleveland, Ohio, gathered to witness a performance of the General Electric "House of Magic" exhibit. The display also included arc welding and industrial heating equipment

"Trouble Ahead" → FLASHES THIS NO. 1 TROUBLE SHOOTER at the first sign of service interruption

Autocall

POWER PLANT SUPERVISORY SYSTEM

Constant supervision of major operating equipment is vital to the successful operation and maintenance of any power plant. It is for this very reason that expert operators are turning to the AUTOCALL POWER PLANT SUPERVISORY SYSTEM. They know from experience, that it provides freedom from costly service interruption . . . safeguards the continuity of the service you are rendering . . . keeps your power plant costs at a minimum.

THE AUTOCALL CO.
401 Park Ave. SHELBY, OHIO

CHECK the new proven signaling and control equipment listed here. Attach this coupon to your business station and it will bring you complete data.

- A. C. Network Supervisory Systems
- Power Plant Supervisory Systems
- Oil Filled Cable Supervisory Systems
- Supervisory Control Systems
- Electronic Signaling Equipment
- Diagram Boards
- Recording Ammeters
- Special Lamp Annunciators
- Special Control Systems
- Relays, Special Devices and Liquid Flow Indicators
- Special Steel Cabinets, Bench Boards and Panels
- Pumping Systems

A complete staff of electrical and mechanical engineers and physicists available for special designs to meet individual problems.

ROME-CABLE
ROME, N.Y.

Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
(In Rounds, Flats and Squares)
Rubber Insulated Wires and Cords
Lead Covered Cables • Multiconductor Power Cables
Network, Service Entrance, Control Cables

ROME-60
ROME CABLE CORP. ROME, N.Y.
That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

ROME CABLE
CORPORATION
ROME, N.Y.
SALES OFFICES:
New York Chicago Cleveland Pittsburgh Detroit
Boston Richmond Philadelphia Los Angeles

The company reported unfilled orders on September 30 of $31,718,124, as compared with $18,335,726 a year ago, and with $19,730,594 at the end of 1939.

Employees at the end of September totaled 15,124, as against 13,317 a year ago, and 14,456 at the end of 1939.

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Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Cutler-Hammer, Inc., has appointed W. T. Roundy to the Atlanta office. He has been assigned to the state of Florida and will make his headquarters at Orlando, according to A. C. Gibson, manager of the company's Atlanta district sales territory. Mr. Roundy is thoroughly familiar with C-H equipment, having served in the testing and inspection departments before engaging in sales work.

W. N. Matthews Corp. has appointed Oliver G. Brush, 700 Education Bldg., Birmingham, Ala., as representative in the state of Alabama, Panhandle of Florida and most of the state of Tennessee. Mr. Brush will have as his associate C. A. Thompson.

Hotpoint Co. has announced that A. A. Borgemenke, sales manager for the company's Philadelphia district, has transferred to the company's New York district office in New York City, where he will assume full responsibility for both the New York and Philadelphia districts. W. L. Sayre, who has managed the Hotpoint New York district for several years, has been appointed manager of the distributing branch at Buffalo, where he will assume responsibility for operation of the several New York Hotpoint distributing branches reporting to the Buffalo office.

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Westinghouse Exhibits Light Circuit Breaker

Westinghouse Electric & Manufacturing Co. demonstrated recently in New York City a new six-ounce circuit breaker which is able to interrupt a short circuit as great as 5,000 amperes in less than one-sixtieth of a second.

J. L. Wagoner, under whose supervision the circuit breaker was developed, told a group of editors and reporters that the new device, which will be on the market soon, combines for the first time the thermal and magnetic principles of current control.

New York Metal Prices

	Oct. 29, '40 Cents per Pound	Oct. 23, '40 Cents per Pound
Copper, electrolytic	12.00*	12.00*
Lead, A. S. & R. Price	5.50	5.50
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc, Spot	7.64	7.64
Tin, Straits	51.50	51.50
Aluminum, 99 Per Cent	18.00	18.00

* Delivered Connecticut Valley.

Field Reports on Business

Business improvement in most lines isbecoming more pronounced as national defense production gets under way. Electrical manufacturers report good business with orders for a diversified line of products. Utilities see need for additional generating capacity over the next few years.

NEW ENGLAND

Important negotiations for increasing central station generating capacity are being brought to a head in this district as the result of the defense program. Factory expansion, necessitated by a steady flow of awards for diversified products for which New England has long held a leading place, continues to command the purchasing of electrical equipment and supplies on a large scale. Recently weekly orders for small motors placed in this area exceeded more than $15,000 and there is little indication of slackening of this rate; line materials are moving in good quantity and inquiries for switch and control, aggregating more than $350,000, are noted. New lines for bringing both power and lighting service to airports and cantonments under construction are responsible for several interesting insulator and pole line material orders, among which is noted a 6,000-unit distribution line insulator award, control apparatus sales totaling in the neighborhood of $8,000 and an encouraging movement in line hardware.

Floodlighting installations as measured for defense are gaining in this area. Factory lighting sales are advancing and include 1,296 Hygrade 100-watt Miralume fluorescent lighting units for Naumkeag Steam Cotton Co., Salem, Mass., and 404 400-watt high-intensity Westinghouse lighting units for an addition to a Connecticut munitions plant. Connecticut Telephone & Electric Co., Meriden, Conn., has bought a 20-kw. electric furnace for forging and hardening magnet steel. Sebasco Lodge, near Bath, Maine, has installed 30 storage type electric water heaters.

PACIFIC COAST

Major appliance reports, for typical sections of the Pacific Coast, reveal more than 50 per cent sales increase in refrigerators over comparable period of 1939 and 35 per cent average increase in table-model radios, with consoles running about even. These figures are for pieces, not dollars. Mare Island Navy Yard housing project specifies 600 electric refrigerators. Dealers and wholesalers have ordered heavily in table appliances and report a not unexpected increase in demand for higher priced or more elaborate items and sets.

Several defense construction awards have recently been made. Recent defense manufacturing awards along the coast include $35,327,442 to Southern California Shipbuilding Co. for six airplane tenders at Longbeach and $2,535,367 for plant starter assemblies to a San Diego firm. Shipyard expansion at Seattle is costing $4,600,000, at San Pedro $2,756,000, at San Francisco $10,500,000.

Recent interesting orders feature a group of Boulder plant awards—$248,694 for three G.E. 27,500-kva. transformers and $162,405 for three 800-amp., 230-kv. circuit breakers, $148,500 for 168-in. butterfly valve, $46,549 for 230-kv. disconnect switches and $37,110 to Bowie for a 23,000-volt bus structure. Bonneville system awards include one-half carload of copper bars and $12,500 for aluminum cable and hardware; four 600-amp., 34,500-volt Westinghouse circuit breakers were bought for irrigation service at Polson, Mont. Low bid for city of Los Angeles unit No. 1 steam-generating plant building was $556,455. A recent Mare Island award of $392,117 was almost wholly for substation and other electrical work.

NEW YORK

Improvement in most businesses continues at an accelerated rate. National defense orders account for the most part for the stimulation of heavy industries. Production rates are being increased in order to prevent a bottleneck.

With the increase in payrolls, consumer purchasing power is being felt in retail trade. Department stores report better buying, with prospects that this will be more noticeable as the holiday season approaches.

The political campaign will be over next week and industrialists feel that a quick decision can be reached on long-term planning. The war development this week has brought on new uncertainties and it will be some time before the situation is cleared.

In the electrical industry every effort is being made to speed production and shipments. Electric utilities see need for increased capacity over the next few years and are planning accordingly. Orders have been coming in for a wide variety of equipment. Some inventory purchases are being made.

Utilities are getting appliance campaigns under way to bolster load. There has been a sharp increase in washer and ironer sales. Manufacturers feel that the new low price machines have tapped a new market.

Business in the Pittsburgh area shows further expansion during the past week. Steel production recorded counter-seasonal gains.

CHICAGO

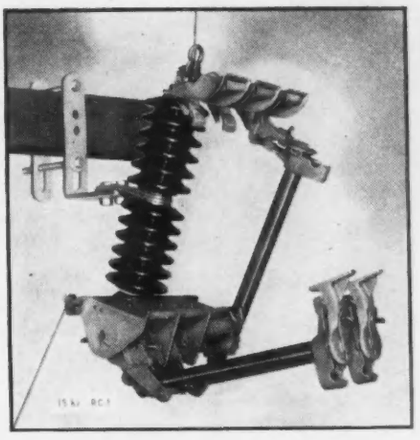
Further encouragement was derived from the business picture last week as activity in nearly all lines kept pushing forward to new high levels. Despite practical capacity operations in the Chicago steel mills, order backlogs have grown still further. Strong demand for machine tools has necessitated greatly extended periods of delivery. Orders for a wide variety of electrical equipment are being placed in rapidly increasing volume, following the steady expansion of industrial activity.

Employment and payrolls have made sharp gains during October. Retail trade registered substantial gains over the previous week, with department store sales rising to 13 per cent above a year ago. Suppliers of parts and materials to the automotive industry are being pressed to meet the demands of increased production and the additional requirements of large defense contracts.

Defense program contracts placed in this area are on the up-grade and the accumulating indirect benefits are spreading wider and more rapidly. Some of the orders for electrical equipment reported by local manufacturers last week were: Electrodes and welding rods, $32,743; transmission systems, $49,836; switchgear, $59,400, and motors, $100,000.

Goodman Manufacturing Co. has started construction of a $100,000 addition and will later install four 5-ton electric traveling cranes. Iowa Electric Light and Power Co. will construct a $1,000,000 Diesel engine power plant at Marshalltown, Iowa.

RECLOSING FUSES WERE PIONEERED BY SOUTHERN STATES



THE *RC-1* RECLOSING CUTOUT PERFORMS *2 Duties* ON YOUR LINES

Primarily the RC-1 Reclosing Cutout's job is to protect the expensive equipment on your system. When an overload occurs, the RC-1's sure-fire action interrupts the fault current and thereby protects costly transformers and isolates the fault from the remainder of the system. An *inherent* time delay sufficient for the trouble to clear elapses. Then . . .

The circuit is closed and service is restored to your customers by the dependable reclosing mechanism.

As a result of the RC-1's reliable action, long service interruptions are virtually eliminated . . . patrols are avoided . . . meters are kept turning and customers are pleased with the continuity of service.

Typical of improvements in the RC-1 is the new type stainless steel, fatigue resistant reclosing spring that has ample energy to close the spare cartridge next in line after a fault has been interrupted. The RC-1's sequence of operation is continuous.

"Built to do the job" design makes the RC-1 superior to protective fuses of less rugged construction.

Why not investigate Southern States' RC-1? We will be glad to send you descriptive literature.

Write Fuse Department now for Bulletin No. 179

Southern States

Equipment (SS) Corporation

28 S. 20th St., Birmingham, Ala.

NEWS ABOUT PEOPLE

Niagara Hudson Elects Tattersall to New Office

Election by the board of directors of Charles A. Tattersall as a vice-president of Niagara Hudson Power Corp. has been announced. Mr. Tattersall continues as secretary of the corporation.

Mr. Tattersall's connection with the corporation and its subsidiary companies extends over a period of 32

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years. He was employed in various departments of the Niagara Falls Power Co. and predecessor companies and in 1919 became assistant to the vice-president and general manager. In 1927 he became assistant to the president of Buffalo, Niagara & Eastern Power Corp. and later was elected a vice-president. He was also made an assistant vice-president of Niagara Hudson Power Corp. in 1931 and became secretary of the corporation in 1935.

Mr. Tattersall is a member of the executive board and chairman of the publicity and advertising committee of the American Gas Association and a member of the executive committee of the Empire State Gas & Electric Association.

▶ GEORGE A. ORROK, well-known consulting engineer and a member of the engineering firm of Orrok, Myers & Shoudy, New York, sailed for Panama on October 24. Mr. Orrok will serve as consultant on new construction operations at the Canal.

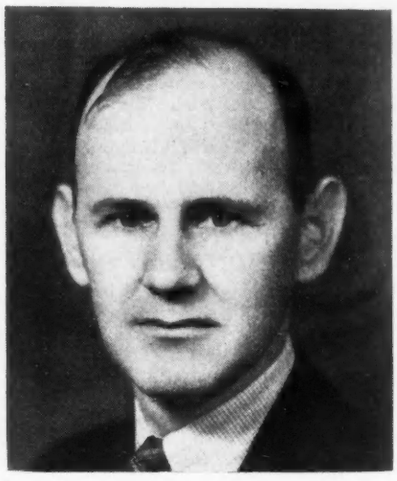
▶ ARTHUR S. DEWING of Boston, Mass., has been elected chairman of the board of directors of the Michigan Public Service Co., Traverse City, Mich. Mr. Dewing was formerly professor of finance at the Harvard School of Business Administration, retiring in 1933. He is well known in the public utility field for his work in acquiring and developing various power companies. Besides his activity in the management of public utilities, Mr. Dewing has also written several standard text books on financial subjects, probably the best known of which is "Financial Policies of Corporations."

▶ J. O. HENKEL, JR., manager of the power system operated by the city of Huntsville, Ala., with Tennessee Valley Authority power, resigned at a recent meeting of the Power Board. KARL WOLTERSDORF was elected to succeed him. Mr. Henkel will resume his connection with the Alabama Power Co., which he left to take charge of the city power assignment. Mr. Woltersdorf will resign his connection with the utility company to become manager for the city board.

▶ J. V. GONGWER, formerly connected with construction of the first and second Cushman dams of the Tacoma, Wash., municipal light department project, has returned to the department as chief construction engineer. Mr. Gongwer will make a survey of the possibilities of the city obtaining additional power, which local industries will need in the near future. The survey will include a comparison of costs of purchasing the power with costs of producing it possibly with addition of another hydro-electric plant.

G. L. Furr New President of West Virginia Group

G. L. Furr, who was elected president of the Public Utilities Association of West Virginia at the recent convention at White Sulphur Springs, has been assistant division manager of the Appalachian Electric Power Co., at Bluefield, W. Va., since 1936. He entered the employ of the utility company in 1916 as an electrician and returned



to the company upon completion of military service in the World War. He then spent a short period of time in the lighting engineering department of the General Electric Co., but again resumed his connection with Appalachian Electric Power in the capacity of operating engineer in 1922. In 1928 he was made general superintendent in charge of construction and operation of the Bluefield division of the company. In 1936 he was made assistant division manager, the position he now holds.

Mr. Furr has been connected with the work of the Public Utilities Association of West Virginia since 1928.

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▶ L. M. STINCHCOMB has been appointed sales manager of the electrical division

ORANGEBURG HAS *long* BEEN PART OF

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Have you
FACTS
on
ORANGEBURG?

What it is, what it does, how it saves time, trouble, and cable . . . all are contained in Catalog 46—a twenty-four page, fully-illustrated catalog which will be sent to any user of conduit without cost or obligation.

When far-sighted distribution engineers purchased Orangeburg for the first "underground" in Savannah, they bought more than merely thousands of feet of conduit. They made an *investment in complete and permanent cable protection.*

Complete cable protection because corrosive underground water cannot penetrate Orangeburg's walls or joints and reach the cable sheath. Nor will this chemically-inert, neutral material contribute to sheath corrosion.

Permanent cable protection because being essentially pitch, Orangeburg is essentially everlasting. Installations made forty or more years ago are still providing clear, usable raceways. Thirty-year installations are common.

Add *complete* cable protection to *permanent* cable protection and you have the reason why thousands of distribution engineers—in Savannah, Boston, New Orleans, Kansas City, San Diego and a score of other cities from coast to coast—prefer Orangeburg.

Sales Agent — Distributors

General Electric Supply Corp.

Graybar Electric Co., Inc.

MADE AT ORANGEBURG, NEW YORK BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVE., NEW YORK CITY

ORANGEBURG NOCRETE for installation without concrete encasement
STANDARD for installation with concrete encasement

of the H. B. Sherman Manufacturing Co., Battle Creek, Mich. Mr. Stinchcomb has traveled for a number of years for the Sherman company in the states of Michigan, Ohio, Indiana, northern Kentucky, western Pennsylvania and in Chicago. In addition, he has carried on development engineering and sales promotional work.

▶S. N. F. HEDMAN, general turbine designing engineer at the General Electric Co., Lynn (Mass.) Works, has been appointed assistant designing engineer of the mechanical drive section, turbine department. He was graduated in electrical engineering from the University of New Hampshire in 1925 and has been with the company at Lynn ever since.

▶JESSE H. LIDE has been appointed assistant manager of the merchandise advertising and sales promotion department of the Westinghouse merchandising division. For the past six years Mr. Lido has been sales development manager of the merchandising division's Middle Atlantic district, with headquarters in Philadelphia. The position to which he has been appointed is a newly created position with headquarters in Mansfield, Ohio. He joined the Westinghouse organization in 1924, serving in East Pittsburgh, Mansfield and Atlanta. He then left the company to become advertising manager of the Rome Wire Co. and later of General Cable Corp., but returned in 1932, joining the merchandising division in Boston. In 1934 he became sales development manager in Philadelphia. He is being succeeded in that position by S. F. Myers, formerly sales development manager of the air conditioning and commercial refrigeration department in East Springfield, Mass.

▶KENNETH S. WYATT, cable engineer, has joined the staff of Habirshaw Cable and Wire Division of the Phelps Dodge Copper Products Corp. of New York. Mr. Wyatt, widely known in engineering circles here and abroad, formerly was technical director of the Enfield Cable Works, Ltd., London, England, and in recent years has been engaged in the development of the Hochstadter compression cable, having installed two systems for the Central Electricity Board of London and others in Yorkshire and Hackney-Walthamstow. Mr. Wyatt was associated with the Detroit Edison Co. for nearly ten years, developing improvements in high-voltage cable insulation, both through research, particularly the development of analytical methods for detecting deterioration and evaluating cable quality, and also through extensive committee work in the American Institute of Electrical Engineers, and in the Association of Edison Illuminating Companies.

OBITUARY

George B. Cortelyou

George B. Cortelyou, retired president of the Consolidated Gas Co., now known as Consolidated Edison Co. of New York, who died on October 23 (ELECTRICAL WORLD, October 26, page 4), took a prominent part in the industrial and political life of this country during the early part of the twentieth century. He was head of the New York utility system for 26 years, from 1909 to 1935, served in three Cabinet positions and was the personal friend and associate of three United States Presidents.

Mr. Cortelyou was born in New York

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City in 1862. He entered government service in the office of the Appraiser of the Port of New York, later entered the post office department, and subsequently became confidential stenographer to the surveyor of the Port of New York. His Washington career started in 1891 when he became private secretary to the Fourth Assistant Postmaster-General. Subsequently he served as secretary to Presidents Cleveland, McKinley and Roosevelt. Mr. Cortelyou entered the Cabinet as the first Secretary of the newly created Department of Commerce and Labor while Theodore Roosevelt was filling out President McKinley's unexpired term. When Roosevelt was elected, Mr. Cortelyou entered the new Cabinet as Postmaster-General and later became Secretary of the Treasury, serving until the end of the Roosevelt administration. In 1909 he became president of Consolidated Gas.

Mr. Cortelyou had the distinction of being the only person to serve as president of both the American Gas Association and the National Electric Light Association. In 1918 he became the first president of the American Gas

Let These Consistent READERS Tell You:

Good Advertising Pays in

ELECTRICAL WORLD

DISTRIBUTION ENGINEER

"... I usually go through the ads for new equipment and tools."

VICE-PRES. IN CHARGE OF OPERATIONS

"... I always look at all of them. I would say that they (the advertisements) are just as valuable to me as the articles."

INDUSTRIAL POWER SALESMAN

"The ads are very important to me. They are the first place where I look to get ideas on new equipment and apparatus."

SUPERINTENDENT OF METERS

"I like to keep up with what is going on. I always go through the ads — they are a good way to find out what is new."

CHIEF ENGINEER

"The advertising is as carefully read as the text and I feel it is as valuable to my department."

SYSTEM PLANNING ENGINEER

"Usual procedure is to first look over all the ads. Advertisers' Index is something I use a lot. Have been occasions when I sent requisitions into New York office for equipment I've seen advertised and found out later the manufacturer has a branch office out here in the middle west. I suggest you give these branch offices in all your ads."

LIGHTING ENGINEER

"These ads are always interesting to look over — best place I know of to keep up with any new stuff coming out."

TRANSMISSION ENGINEER

"Advertising ranks high in calibre and always observe it closely for wire ads."

SUBSTATION SUPERVISOR

"I give the advertising pages as much time as anything else."

ELECTRICAL ENGINEER

"I think the advertising you carry is about the most valuable part of the magazine to me. I think it does more to keep me up on new developments and trends in the industry than anything else."

PROTECTION ENGINEER

"To me the ads are just as important as the text. They are one of the sources I have for buying."

LOAD DISPATCHER

"ELECTRICAL WORLD advertising is studied and frequently used."

SUBSTATION ENGINEER

"Look at the ads — consider this an important feature. Have major problems on design work and through the ads it helps solve things."

PLANT SUPERINTENDENT

"Read the advertising as much as I do the magazine itself. For new equipment out, the ads are usually the first place you find it."

SYSTEM OPERATOR

"I read the ads — pick out my ads, anything pertaining to line of work."

Electrical World

Serving a Huge and Ever-Growing Market

A McGraw-Hill Publication, 330 W. 42d St., N. Y. C.

No. 11 of a series of factual messages designed to demonstrate that GOOD ADVERTISING *in a leading business publication will invariably increase sales.*

CAN YOU LAY PIPE UNDERGROUND THIS FAST?

Here are just a few of the performance records of the Greenlee Pipe Pusher . . . each one proof that the Greenlee is easier and faster. These pushes were all made with only one or two men pumping the handles. On each one of these jobs, the time saved over other methods was more than 50%. Greenlee Pushers eliminate the expense of digging long trenches, tearing up lawns, breaking through concrete, backfilling, and tamping. Write today for information about the No. 790 pusher for 1¼ to 4-inch pipe or the No. 795 for large drainage ducts, and pipe beyond 4 inches.

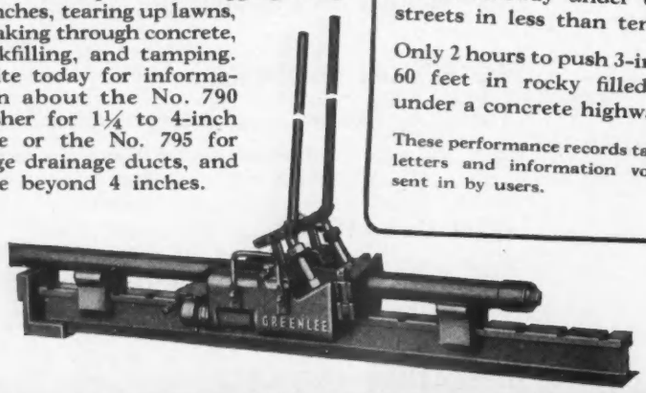
2½-inch pipe pushed 165 feet under Michigan Blvd., Chicago, in 9 hours. Pushed from 3rd sub-basement.

3-inch pipe pushed 130 feet in dry hard soil under concrete pavement in 11 hours.

23,800 feet of 1½" galvanized iron conduit installed for fire alarm raceway under concrete streets in less than ten weeks.

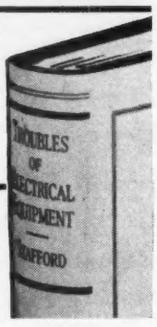
Only 2 hours to push 3-inch pipe 60 feet in rocky filled-in soil under a concrete highway.

These performance records taken from letters and information voluntarily sent in by users.



GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

A trouble-shooting tool *that will pay for itself in a week's time*



- **SHOWS HOW TO QUICKLY LOCATE** motor troubles — transformer troubles — circuit breaker and relay troubles — troubles of lightning arresters — insulation troubles — voltage-regulator troubles — cable troubles.
- **SHOWS HOW TO DIAGNOSE THEM ACCURATELY**
- **SHOWS HOW TO CORRECT THEM**

This book brings you in compact, usable form practical pointers and trouble charts that you will use the first day you get the book in your hands.

JUST OUT

New 2d Edition Revised and Enlarged

373 pages, 6 x 9, 330 illustrations 25 tables, $3.00

10 DAYS' FREE EXAMINATION

MAIL THIS COUPON

Troubles of Electrical Equipment

Their Symptoms, Causes and Remedy

By H. E. STAFFORD, Consulting Engineer

This book covers the symptoms, causes and remedy of troubles of both a-c and d-c apparatus usually found in the average industrial plant. Includes priceless practical hints on efficient operation and maintenance. A practical, how-to-do-it book that is an indispensable job manual for the electrical maintenance man. All formulas illustrated by practical examples and all technical terms explained in everyday English.

McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y.
Send me Stafford—Troubles of Electrical Equipment for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

City and State.....

Position..... Company.....W. 11-2-40

(Books sent on approval in U. S. and Canada only.)

Association, serving two terms. He was elected president of the National Electric Light Association in 1932, and later became president of the Edison Electric Institute.

Floyd L. Carlisle, chairman of the board of Consolidated Edison Co., paid the following tribute to Mr. Cortelyou:

"Mr. Cortelyou was a valuable and valued public servant no less in the field of American business than in the distinguished public offices which he filled so ably. He brought to the presidency of Consolidated Gas Co. a broad experience, a mature judgment and a splendid human quality. During the 26 years in which he was chief executive officer of the companies in this public utility group he had the respect and the warm affection of the many thousands who worked with him. His death brings a sense of personal loss to all of us who were privileged to be his associates."

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▶ JOHN D. GAREY, for the past four years power plant superintendent of the New Brunswick Power Co., St. John, N. B., died recently, at the age of 55. Mr. Garey had been ill for about a year. He had been in the company's service for 30 years and occupied the position of chief engineer for 25 years.

▶ ALBERT E. BONNET, 66, chief inspector of the Hartford, Conn., division of the Hartford Steam Boiler Inspection & Insurance Co., for the past seventeen years, died at his home in Wethersfield, Conn., on October 6. He was born in Brooklyn, N. Y., and was educated at Stevens Institute of Technology. After several years in stationary and marine engineering, including service with the U. S. revenue cutter fleet in Alaskan waters, he joined the insurance company's staff at New Orleans, later being attached to its New York office.

▶ EIVIND STYFF, chief electrical engineer, power plant department, Aktieselskapet Norsk Elektrisk and Brown Boveri, Oslo, Norway, died recently, according to information received in this country. A graduate of the Technical University of Norway in 1915, he entered the employ of Norsk Elektrisk and Brown Boveri as a designer in the department of power plant engineering. He was made engineer in charge of the department in 1918. From 1923-25 he was employed as design draftsman and checker by Pacific Gas & Electric Co., San Francisco, Calif. He returned to Norsk Elektrisk and Brown Boveri in 1925 as electrical engineer in charge of power plant engineering and was later given the title of chief electrical engineer of the department.

Recent Rate Changes

WISCONSIN POWER & LIGHT CO. has filed with the state Public Service Commission a rate reduction which will save 76,000 residential customers $147,500 a year on their electric bills. The reduction has been approved by the commission. Under the new schedule, which became effective on November 1, the fixed charge of 60 cents per month remains the same in all communities and the cost for the initial step of electricity has been reduced.

DERBY (CONN.) GAS & ELECTRIC CO. has made a voluntary reduction in electric light rates effective November 1, despite an increase in operating expenses, according to President Malcolm M. Eckhardt. He said that the reduction would aggregate $15,000 annually. "About July 1 of this year," Mr. Eckhardt said, "we started an investigation to determine the advisability of reducing the cost of electricity to our residential customers. In the early part of September we knew we were faced with a large increase in federal taxes for the year 1940. We also knew our payroll would be increased due to the wage and hour law. On October 1 there was also an increase in the cost of coal, besides many other items. It was decided, however, that notwithstanding this large increase in operating costs a reduction in the residential electric rate should be made. As all our gas and electric rates are under the control of the public utilities commission, we notified them we desired to make a voluntary reduction in our residential rates for all bills rendered on and after November 1, 1940. Based on the electric consumption for the last twelve months this reduction would amount to $15,500 a year."

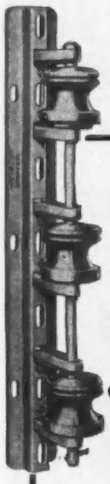
ILLINOIS COMMERCE COMMISSION has announced that rate changes effective in the state during the month of September resulted in an estimated reduction of $78,168 in annual operating revenues. Electric rate reductions accounted for $77,170 of this total. Commonwealth Edison Co.'s reduction of $63,000 is applicable to the original filing of a rate for electric service purchased by the Board of Education of the City of Chicago, effective September 2, 1940. Heretofore service was rendered by the company under a contract with the Board of Education.

PUBLIC SERVICE CO. OF NORTHERN ILLINOIS rate charges for street lighting service in upward of 200 municipalities have been ordered reduced by the state Commerce Commission. The new rates will reduce the company's annual income by approximately $47,000 annually. Each municipality participating in the new lower rates will receive about a 13½ per cent reduction.

FULTON ELECTRIC, LIGHT, HEAT & POWER CO., McConnellsburg, Pa., will file a new tariff with the state Public Utility Commission which will effect a reduction in gross operating revenues of $4,450 a year. The new schedule will be effective for all billings after November 30. The reduction is distributed as follows: residential, $1,614; commercial, $1,715; rural-residential, $755; rural-commercial, $119, and industrial, $248.

CENTRAL ILLINOIS PUBLIC SERVICE CO. has been authorized by the state Commerce Commission to place lower rates in effect immediately for electric service in the City of Bushnell. The new low rates are on an exact level with those of the municipal electric plant operating in Bushnell. The new reduction, plus one which the

MACHINING like this
Makes CONTACTS like this
Twirl the nut on *any* L-M Connector and note how smoothly it glides up the thread. Right there you have the evidence of *perfect machining*, and the big reason why L-M Connectors give you such high pressure between conductors at remarkably low torque. Machining like this, plus the high strength, corrosion-resisting, copper alloy that goes into them, enables L-M Connectors to withstand far higher ultimate torque than service conditions demand. *Save* . . . re-use your L-M Connectors over and over again. Their high conductivity assures low resistance connections, the day they come out of the carton . . . and twenty years later.
L-M Split Bolt Connector
L-M Nut Retainer Connector
L-M Drop-On Connector
LINE MATERIAL CO.
MILWAUKEE, WISCONSIN



YOUR *Secondary* NEEDS *are primary to* GraybaR

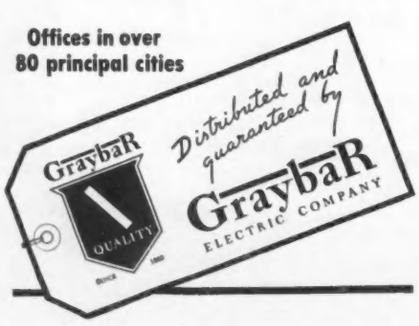
MEETING *all* your needs for pole line hardware is a primary part of GRAYBAR service to the utility industry. Whether the items you want are small or large, important or unimportant, primary or secondary, you get the same kind of "first-run" service on products of "first-line" quality.

The complete line of HUBBARD pole line hardware is promptly available "via GRAYBAR." This means you can choose performance-tested items from a range of types and designs so wide that you're sure to get *exactly* what you want.

What's more, GRAYBAR'S thorough familiarity with all the many types and sizes of pole line hardware items goes far to eliminate "mix-ups" in filling your order and making delivery. You get everything you want from a "one-call" source.

Next time you're ordering pole line hardware, why not call your local GRAYBAR office. Or write direct for specifications and service data on items for any need. Graybar Electric Co., Graybar Bldg., New York.

Offices in over 80 principal cities



company was permitted to place in effect September 20, will mean a reduction of between 15 and 20 per cent in the company's rates.

PLYMOUTH, WIS., ELECTRIC AND WATER UTILITIES will reduce its electric rates January 1, 1941, about $5,100 annually. The reduction will effect 1,500 consumers and apply to residential, business, power and street lighting. The residence lighting energy charge will be reduced from four cents net per kilowatt-hour to three and one-half cents; the commercial lighting from four to three and one-half cents and the commercial power from five to four cents net. In addition, a reduction of one-quarter cent in street lighting service rates will prevail.

MCMINNVILLE (ORE.) CITY LIGHT DEPARTMENT recently announced new rate reductions which will save electricity users approximately $45,000 annually. Bonneville Power Administration serves the municipal system. Savings to McMinnville's domestic power customers will average 27 per cent, Milton H. McGuire, City Light Superintendent said. Savings to commercial customers will average 31 per cent, he said.

•

REA Allots Funds; Contracts Approved

Allotments totaling $1,096,000 for rural electrification in five states were recently announced by Harry Slattery, Administrator of Rural Electrification. These allotments provide for the establishment of two new co-operatives in Michigan and Wisconsin, both "self-help," the enlargement of four power systems, and the additional generating facilities for a system in Michigan.

This brings allotments made by REA since it was established in 1935 to $330,766,614, of which $61,223,000 represents operations during the current fiscal year.

Other recent allotments follow:

ILLINOIS — Spoon River Electric Co-operative, Inc., Lewistown, Ill., L. C. Groat, supt., 212 miles of line, 515 members in Knox, Fulton, Peoria, Schuyler and McDonough counties.

MINNESOTA — Southwestern Minnesota Co-operative Electric, Pipestone, Leroy C. Sabie, supt., $180,000 to build 253 miles of line, 532 members in Pipestone and Rock counties. Mille Lacs Region Co-operative Power and Light Assn., Aitkin, Warren Hallum, supt., $87,000 to build 97 miles of line, 300 members in Aitkin and Mille Lacs counties. Traverse Electric Co-operative, Inc., Wheaton, Simon Lundquist, president, $192,000 to build 234 miles of line, 458 members in Traverse, Stevens and Wilkin counties.

PENNSYLVANIA—Adams Electric Co-operative, Inc., Gettysburg, Cecil Dumbar, president, $308,000 to build 307 miles of line, 808 members in Adams and York counties.

KANSAS—Brown-Atchison Electric Co-operative, Inc., Horton, Edward E. Dorssom, supt., $148,000 to build 145 miles of line, 330 members in Atchison, Brown and Jackson counties.

MISSOURI—Ozark Border Electric Co-operative, Poplar Bluff, Ansel I. Moore, supt., $438,000 to build 456 miles of line, 1,485 members in Butler, Carter, Ripley, Stoddard, Dunklin, New Madrid and Bollinger counties. Laclede Electric Co-operative, Lebanon, J. R. Haugh, supt., $247,000 to build 300 miles of line, 745 members in Laclede, Pulaski, Wright, Camden, Webster and Dallas counties. North Central Missouri Electric Co-operative, Inc., Milan, W. O. McKinney, president, $263,000 to build 270 miles of line, 662 members in Sullivan, Linn, and Putnam counties.

SOUTH CAROLINA—Broad River Electric Co-operative, Inc., Gaffney, G. G. Inman, president, $233,000 to build 270 miles of line, 907 members in Cherokee, Spartanburg and Union counties.

VIRGIN ISLANDS — Virgin Island Co., Christiansted, St. Croix, Virgin Islands, $150,000, of which $68,500 will be used to build 40 miles of line to serve 522 members, and $81,500 will be used for the construction of a generating plant. This borrower previously has been allotted $40,000 for distribution lines and $35,000 for the construction of a generating plant, which were rescinded.

Construction contracts approved between September 19 and October 4 include the following:

ALABAMA—Cullman Electric Co-operative, Cullman, L. Petree, supt., and Francis and Haley, Birmingham, Ala., engineer, contract to W. L. Coston & Sons, Bessemer, 91 miles of line, 350 members; bid $54,448.

ARKANSAS—Mississippi County Electric Co-operative, Inc., Blytheville, H. C. Knappenberger, supt., and Ray W. Chanaberry, Inc., Louisville, Ky., engineer, contract to L. O. Brayton & Co., Dyersburg, Tenn., 105 miles of line, 291 members; bid $60,736.

GEORGIA—Middle Georgia Electric Membership Corp., Vienna, Moody H. Mulkey, Jr., supt., and J. B. McCrary Engineering Corp., Atlanta, engineer, contract to Stuart C. Irby Co., Jackson, Miss., 310 miles of line, 675 members; bid $149,164.

IOWA—Eastern Iowa Light & Power Co-operative, Davenport, S. N. Jordan, supt., and K. R. Brown, Des Moines, engineer, contract to J. H. Hunzinger & Co., Davenport, 169 miles of line, 306 members; bid $116,431.

MINNESOTA — Minnesota Valley Co-operative Light and Power Association, Granite Falls, Oscar W. Swanson, supt., and United Engineering Service, Minneapolis, engineer, contract to Acme Construction Co. and M. Wunderlich, St. Paul, Minn., 441 miles of line, 875 members; bid $274,818.

MISSISSIPPI—Tallahatchie Valley Electric Power Assn., Batesville, William H. Saxton, supt., and Allen and Hoshall, Memphis, Tenn., engineer, contract to Stuart C. Irby Co., Jackson, Miss., 100 miles of line, 325 members; bid $54,893.

NEW HAMPSHIRE—New Hampshire Electric Co-operative, Inc., Plymouth, Leon M. Huntress, supt., and J. R. Worcester & Co., Boston, Mass., engineer, contract to Day & Zimmermann, Philadelphia, 332 miles of line, 406 members; bid $235,127.

NORTH CAROLINA—French Broad Electric Membership Corp., Marshall, Mark W. Bennett, supt., and J. B. McCrary Engineering Corp., Atlanta, Ga., engineer, contract to Melvin F. Burgess, Boone, N. C. for building 116 miles of line, 331 members; bid $82,024.

Globar
REG. U. S. PAT. OFF.

A monthly meeting place for news and views about High Temperature Electric Heat

HERE'S an interesting problem which came to us through the Power Sales Department of a large Electric Utility. The power sales engineers had been called in by an internationally known company which was interested in product improvement and, at the same time, reduced manufacturing costs.

This company produces an oxide, used in an important alloying agent in steel, which has contributed largely to sensational metallurgical advances in alloy steel manufacture. Ordinary heating methods could not be used because of the possibility of contamination of the product. Dust, soot and products of combustion ruled out solid, liquid or gaseous fuels and the high temperature range (2000° to 2300°F.) eliminated all types of electric heating elements but "Globar".

An experimental "Globar" equipped furnace yielded a product 99.997% pure and a careful analysis indicated important cost reductions by the new method. Consequently a large production furnace was built, powered with 30, 58-in. Globar Brand High Temperature Electric Heating Elements, having a connected load of 700 kw. The new furnace has a productive capacity of from 8000 to 10,000 lb. per day and cost approximately $32,000 complete with all electrical and control equipment.

A purity of 99.997% in the product is maintained with the production equipment and the cost of manufacture has been reduced from $1.25 to 24¢ per lb.

Write us about your heating problem. We may also be able to reduce *your* costs and improve the quality of *your* product. Or if you are a utility man, you may have many customers who can profit by the use of High Temperature Electric Heat.

GLOBAR DIVISION
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REG. U. S. PAT. OFF.
NIAGARA FALLS, N. Y.

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No. 8 of a Series. We will be glad to send reprints of the previous numbers if you so desire.

NORTH DAKOTA — Minnkota Electric Power Co-operative, Inc., Grand Forks, Ellerby & Co., St. Paul, Minn., engineer, contract to Sorkness Construction Co., Jamestown, N. D., for construction of a generating plant, bid $237,180.

OHIO—Belmont Electric Co-operative, Inc., St. Clairsville, Harry McAllister, supt., and Putnam and Woolpert, Dayton, engineer, contract to W. R. Cutnam, Columbus, Ohio, 165 miles of line, 470 members; bid $117,317.

OKLAHOMA—People's Electric Co-operative, Ada, E. T. Archer & Co., Kansas City, Mo., engineer, contract to Cater Construction Co., Blue Springs, Mo., 204 miles of line, 388 members; bid $117,236.

PENNSYLVANIA — Valley Rural Electric Co-operative, Inc., Martinsburg, John Denton, supt., and Gibbs & Hill, Inc., New York, N. Y., engineer, contract to Day & Zimmermann, Philadelphia, 207 miles of line, 575 members; bid $176,010.

SOUTH CAROLINA—Santee Electric Co-operative, Inc., Kingstree, Walter E. Blackwell, supt., and J. B. McCrary Engineering Corp., Atlanta, Ga., engineer, contract to Wannamaker and Wells, Inc., Orangeburg, 385 miles of line, 844 members; bid $221,259.

TEXAS — Taylor Electric Co-operative, Inc., Merkel, Johnny Cox, supt., and Midwestern Engineering & Construction Co., Tulsa, Okla., 394 miles of line, 675 members; bid $179,792.

VERMONT—Washington Electric Co-operative, Inc., East Montpelier, Clarke Millen, supt., and engineer, contract to Day & Zimmermann, Philadelphia, 228 miles of line, 560 members; bid $164,018.

•

Canada Reports 30% Gain in Battery Production

Production of electric storage batteries in the first quarter of the year rose almost 30 per cent, while imports of all electric batteries increased 80 per cent, according to the current issue of *Agricultural and Industrial Progress in Canada.*

Factory sales of electric storage batteries in Canada in the first quarter amounted to $1,091,000, as compared with $844,200 in the same period a year ago. Imports of electric batteries of all kinds in the first quarter were valued at $121,900, as compared with $67,700; imports of electric storage batteries rose on the same comparison from $19,800 to $60,200.

•

Seeks to Restrict Co-ops

A move was recently begun to prevent the organization of small electric co-operative associations in the state of South Carolina. In a meeting at Columbia, the South Carolina Federation of Electric Co-operative Associations adopted a resolution expressing itself in favor of co-operatives with a minimum of 1,200 subscribers and 400 miles of rural electrification lines.

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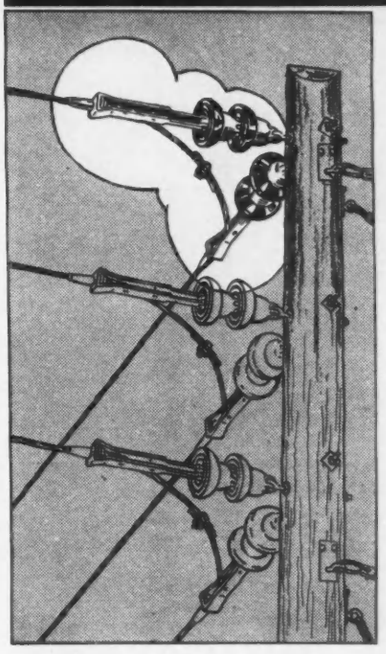
PRACTICE—



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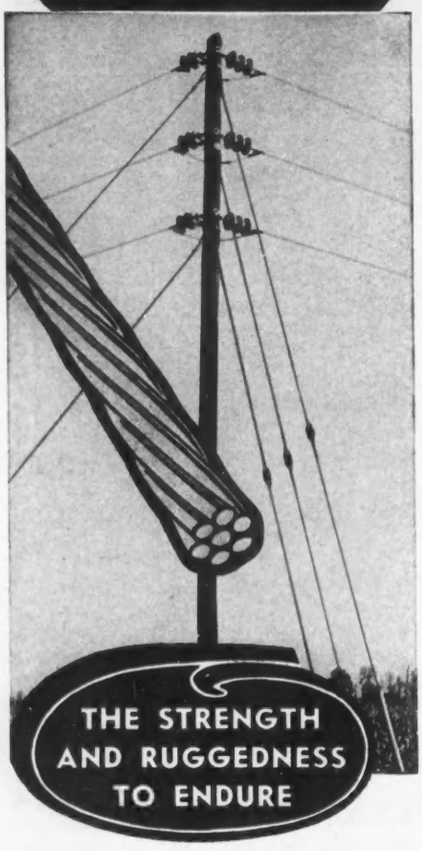

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Crapo Galvanized Steel Strand is readily available in all standard grades and sizes from representative jobbers.

Crapo Galvanized Products also include *Crapo* HTC-130 and HTC-80 Steel Conductors (Solid and Stranded 3-Wire), Construction Wire, Tie Wire and Ground Wire.

INDIANA
STEEL & WIRE CO.
MUNCIE, INDIANA

Tabulating Machine Records for Stores Control

[*Continued from page 52*]

It may seem to be an undesirable loosening of authority to decentralize part of the control work and put it in the warehouses and it would be were it not for the additional facilities we were able to put into the hands of the division storekeepers under a fully mechanized stock record system.

Throughout the records described above there is an average lag of six days following the transaction before the receipt of the various tabulated reports mentioned. Offsetting this delay, the records themselves when received need no analysis. They are "open books," complete and ready for use by the division storekeepers.

Close Touch with Stock

One definite result of the change in our system has been to put the division storekeepers and the storekeepers who are in charge of the individual warehouses in closer touch with their stock than they ever were before. More complete information is now at their fingertips as soon as the reports are received. Complete knowledge of similar stock carried in other warehouses is now available in a routine way, where formerly it could be obtained only with great difficulty. Transfers of material from one warehouse to another are easily and directly arranged. The storekeepers are at last intimately in touch with their stocks.

It is true that some of the record-keeping costs have been shifted from the stores department to the tabulating bureau, but the cost to the company is no greater than before and we are getting vastly more information. As to the investment, it is under control and has decreased considerably since the changes were instituted, but it is too early to forecast the eventual decrease. We are satisfied, however, that whatever stock investment figure we finally reach will be the best that can be done. It will be backed up with full information and will be set with full consideration of all the matters in any way related to it.

This kind of a system works well in a company of our size where other departments are served by a central

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Electrical Specialties
High and Low Voltages

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CENTRAL STATION
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gives you the data you need to know
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Provide dependable anchoring when poles are subjected to unusual strains from storms. Made of tough, certified, rust resistant, malleable iron for extra strength and holding power. Write for new bulletin.

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Bus & Cable Connectors
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TYPE "FT"
Solderless Connectors

Interchangeable halves, DURONZE bolts and nuts. Rounded edges prevent conductor stress.

Electrically and mechanically proportioned to the size of bus, these connectors carry full rating of extra heavy tubing corresponding to the tap size.

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tabulating bureau. I shall not attempt to say to what extent this system could be used by a medium-sized or small company.

One important result of the new system has been to facilitate the taking of inventories and reconciling them with the general books. Under our previous system it was necessary to take field inventories throughout the year, reconcile them with the local stock records and at stated periods draw off local stock record balances at all locations and make the reconciliation with the general books. Now, under the new system, it is possible to close up the records as of Friday night, send the papers to the tabulating bureau, take the physical inventory on Saturday, and on Monday morning have for comparison with the inventory a tabulating tape on which is shown stock number, abbreviated description and balance which should be on hand. This valuable feature alone greatly influenced us in reaching a decision about making a change in the system.

In conclusion, I may say that we reached our revised system only by adopting a very open-minded way of thinking. It took some courage to depart from practices we had followed for years, but with the wholehearted co-operation of our warehouse and office staffs in the stores department, and of the accounting department, tabulating bureau and audit division we feel that we have taken a real step forward in the line of stores department record keeping.

•

Awards Turbine Contract

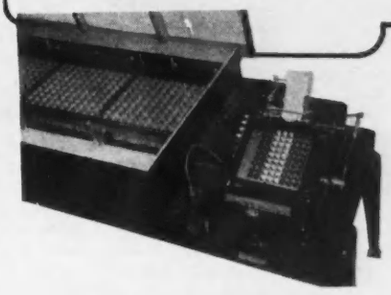
Nantahala Power & Light Co., Franklin, N. C., has awarded a contract to the Newport News Shipbuilding & Dry Dock Co. for a 60,000-hp. hydraulic turbine and accessories, including 8-ft. butterfly valve, for installation in new hydro-electric generating station to be constructed on the Little Tennessee River, North Carolina, at a contract price of about $200,000.

•

Utility Resumes Program

Union Electric Co., St. Louis, has resumed its Sunday evening broadcast over station KMOX at 6.30 p.m. The series of radio programs is given under the title, "The Land We Live In."

When crowded for time-this is the sure way to finish the job on schedule



The One-Step Method of Bill Analysis . . .

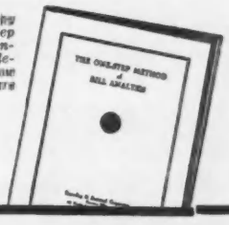
Speed in obtaining an accurate preview of your load building plans may be the determining factor in their success.

"Customer Usage Data at Lower Cost . . . . . do it in Less Time"

You'll find the solutions to these important problems in the R & S one-step method of bill analysis.

The R & S Method will give you an accurate survey of the most complicated condition in a minimum of time . . . and saves up to one half the cost of other methods. The standard report shows 1—The kw. hrs. per bill, 2—the number of bills; 3—Consumption in kw. hrs.; 4—Cumulative number of bills; 5—Cumulative consumption in kw. hrs.

Write for your copy of "The One-Step Method of Bill Analysis" which describes briefly how these savings are made.



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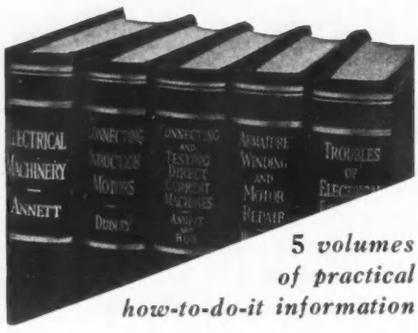

5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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We want you to examine this Library for 10 days. If you don't want the books at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

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Sales Opportunities

WINONA, MINN.—Mississippi Valley Public Service Co., Winona, is considering expansion and improvements in local steam-electric generating station, including installation of new turbine-generator unit, high-pressure boiler and auxiliary equipment. Cost reported close to $1,000,000. Also, plans extensions in primary and secondary lines following completion of plant addition.

MIAMI, FLA.—Intercontinent Aircraft Corp., recently organized as an interest of Intercontinent Corp., 30 Rockefeller Plaza, New York, N. Y., Bruce D. Leighton, president, plans installation of motors and controls, switchgear, duct lines, conveyors, electric hoists and other equipment in new aircraft-manufacturing plant at LeJeune Road and N.W. Thirty-sixth Street, Miami, where tract of about 103 acres of land has been selected. Plant will comprise about 100,000 square feet of floor space, divided into several units for parts production and assembling. A power house is planned. Erection will begin soon. Weed & Reeder, 1777 Biscayne Boulevard, Miami, are architects and engineers. William D. Pawley, 3190 Peachtree Drive, Miami Beach, Fla., is chairman of board.

PORTSMOUTH, N. H.—Public Works Officer, Navy Yard, Portsmouth, plans extensions in primary lines for outside power connection with high-tension system of New Hampshire Gas & Electric Co., which will furnish service. Appropriation of $50,000 has been authorized for work.

ALEXANDRIA, LA.—City Commission receives bids until November 14 for new turbine-generator unit and auxiliary equipment for installation in municipal power plant. Also, until November 20 for condenser unit; and until November 28 for switchboard.

BONNEVILLE, ORE.—United States Engineer Office, Bonneville, receives bids until November 13 for 15-kv. metal-enclosed transfer bus, f.o.b. contractor's plant, for Bonneville power project (Circular 101).

MARSHALLTOWN, IOWA—Iowa Electric Light & Power Co., Cedar Rapids, has plans under way for new power plant at Marshalltown, with installation of two 3750-hp. engine units of diesel type, generators and auxiliary equipment. Cost estimated close to $1,000,000. Proposed to carry out work during 1941. Also will make extensions in primary and secondary lines in same area as soon as new station is ready for service.

VANCOUVER, WASH.—Aluminum Co. of America, Inc., Gulf Building, Pittsburgh, Pa., plans installation of motors and controls, switchgear, transformers and accessories, duct lines, industrial lighting facilities, conveyors, electric hoists and other equipment in three one-story additions to new plant near Vancouver, to be used for fabricating service for parts production for military airplanes for Federal Government. All equipment will be electric-operated. Company has arranged with Department of Interior for increased power supply from Bonneville transmission lines, to handle a connected load of 162,500-kw., instead of 65,000-kw., provided by former contract. Capacity of power substation will be increased. Entire project reported to cost over $2,500,000.

MOUNTAIN VIEW, WYO.—Bridger Valley Electric Association, Mountain View, plans expansion in electric generating station, with installation of additional equipment. Financing has been arranged through Federal aid, totaling about $30,000. Van A. Rupe is president, in charge.

KANSAS CITY, MO.—United States Engineer Office, Davidson Building, receives bids until November 19 for nine indoor metal cubicles and equipment; also, for vertical and bench switchboards for control of 13,800-volt circuits, for hydroelectric power plant at Fort Peck, Mont. (Circular 1).

PENSACOLA, FLA.—Public Works Officer, Naval Air Station, plans extensions in primary lines for outside connection with system of Gulf Power Co., which will furnish service at station. Cost estimated at $55,000 and appropriation in that amount has been authorized.

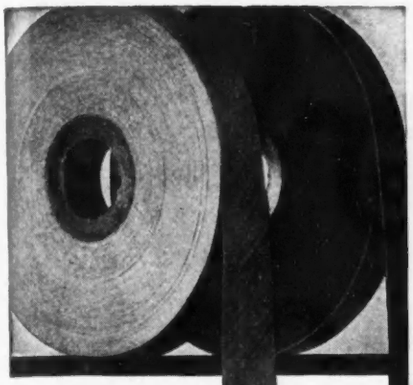
KANSAS CITY, MO.—Remington Arms Co., Inc., Barnum Avenue, Bridgeport, Conn., manufacturer of firearms and ammunition, plans installation of motors and controls, switchgear, motor-generator set, duct lines, industrial lighting facilities, conveyors, electric hoists, electric trucks and other equipment in new ammunition plant on site now being secured in vicinity of Kansas City. Project will be carried out by company in co-operation with War Department, Washington, D. C., which will provide fund of about $15,000,000 for project and hold title to property. Remington company will operate plant under contract arrangement, with entire output for Government. Proposed to begin work as soon as site has been determined, with completion scheduled in 1941.

CINCINNATI, OHIO—United States Engineer Office, Postoffice and Courthouse, Cincinnati, receives bids until November 19 for electric-operating pumping units and accessories for Barrier dam, Mill Creek, Cincinnati, including motors, controls, etc. (Circular 33).

WATERTOWN, S. D.—City Council has plans under advisement for extensions and improvements in municipal power plant, including installation of new generating unit and auxiliary equipment. Surveys and estimates of cost are being made by Ralph D. Thomas & Associates, Inc., 1200 Second Avenue South, Minneapolis, Minn., consulting engineer.

PORTLAND, ORE.—Administrator, Bonneville Project, Department of Interior, Portland, has plans maturing and will take bids soon for new 230,000-volt transmission line from Grand Coulee hydroelectric power station, Grand Coulee, Wash., to point in Puget Sound area, where connection will be made with Bonneville system, about 185 miles. Cost estimated over $3,800,000. Also for new transmission line from Midway to Yakima, Wash., forming section of Bonneville-Grand Coulee power system.

MIDDLETOWN, OHIO—American Rolling Mill Co., Middletown, plans installation of motors and controls, switchgear, regulators, conveyors, electric hoists and other equipment in connection with expansion and improvements in iron and steel mills, to provide for increased capacity. Also will carry out similar program at branch plant at Hamilton, Ohio. Entire development will cost about $5,000,000, of which close to $4,000,000 will be used at Middletown mill.



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VARNISHED INSULATIONS—MAGNET WIRE COILS—CAPACITORS

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Saves many thousands of dollars annually by elimination of tampering and theft of current. Seals all types CS meters effectively and permanently. Cannot be removed without destroying or mutilating. SEND FOR SAMPLE.

The **STAR** PORCELAIN COMPANY

51 Muirhead Ave. Trenton, N. J.

Substation Oil Purified by Trailer-Truck Set

[*Continued from page 48*]

brackets at a level. To level the truck in the field an adjustable landing gear at the front of the dropped section is used, together with two 2-ton portable jacks that are carried in built-in compartments in the sides of the trailer.

Auxiliary Equipment

In addition to the 110-volt circuit (for lights, electric drill pumps, etc.) the trailer is equipped with a six-volt light in the ceiling at the front, operated from the storage battery on the truck, and which is used to illuminate the interior until the outside power connections can be made.

Control switches for the heater, pumps and centrifuge are located on a panel beside the centrifuge. Remote-control switches for an air compressor, small oil pumps and other small equipment are located just inside the rear door.

All wiring in the trailer is in conduit and all pipes are placed so connections are easily accessible for making repairs.

A 7-cu.ft. air compressor has a connection leading down through the floor for connecting an air cleaning hose or paint spray hose.

Just in front of and to the right of the workbench is a small tank for clean oil, from which a connection leads to a small pump that is used for filling bushings and small switches.

Tires on all wheels of the unit are 7.50 by 20 in. The weight on the front axle is 2,710 lb., on the center axle 7,200 lb. and on the rear axle 8,250 lb.

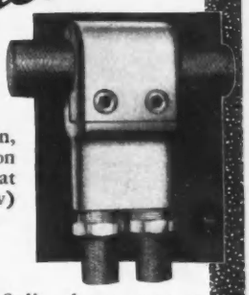
Four-Year Record of Lighting Promotion

[*Continued from page 67*]

sumption of some 2,000 residential customers. Study of this record in relation to average customer data shows that a home-lighting demonstration adds about 230 kw.-hr. per year on the average. The range is from 280 kw.-hr. for high-use customers down to 180 kw.-hr. for the low-use group. The study showed further that home-lighting demonstrations practically tripled the rate of movement of minimum-use customers into the medium-use class.

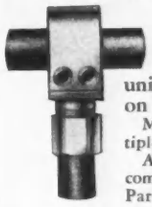
The **MOST COMPLETE** LINE OF

Tee Connectors



ALL good types —any size.

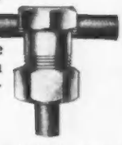
With a *hinged clamp* for the main, the Penn-Union Type HFM (at right, and below) is easy to apply.



Split sleeve contact unit gives permanent grip on branch.

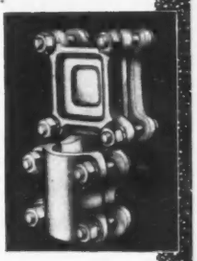
Made for single or multiple branch connections.

ALSO CABLE TAPS — a complete line of 90° and Parallel taps, for one or more branches.



COMPACT and POSITIVE. The Penn-Union Type SM gives equal tightening on the run and tap. Self-locking, dependable.

CLAMP TYPE TEES for all sizes of tubing and cable—a full line. Machined contact surfaces.



MANY MORE TYPES— for all combinations. For connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes. You will find that the Penn-Union line has *exactly what you need.*

FOR ANY CONDUCTOR FITTING—Terminals, Service Connectors, Studs, Two-Ways, Ground Clamps—see the THOUSANDS in the Penn-Union Catalog.

Preferred by the largest users, who have found that *Penn-Union on a fitting is the best guarantee of Dependability.*

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the consultants whose cards appear on this page with the confidence justified by the offering of these special services nationally.

LETTERS TO THE EDITOR

Operating Temperature of Power Transformers

To the Editor of ELECTRICAL WORLD:

Your editorial in the September 7 issue of ELECTRICAL WORLD on the subject of "Transformer Temperatures" is interesting, but we do not agree that Mark Twain's comment "Why, if the weather was so important, didn't somebody do something about it," applies in this case. Westinghouse certainly has done something about this matter of transformer temperatures. We have for several years been promoting the principle of operating transformers by copper temperature and have developed the necessary equipment.

The "TR" relay does the trick and can be applied to any transformer, large or small. In fact, it is applied to all "CSP" distribution transformers, "CSP" power transformers, "CSP" unit substations and to other large power units.

It is not a temperature-indicating instrument, but it provides the means for practical operation of a transformer by copper temperature. That is, it will permit it to carry any useful overload without tripping unless the copper temperature should approach the burnout point. We sometimes call it "burnout protection." The limiting copper temperature at which the relay operates is not a fixed value, but is a function of the duration of the load—extremely high loads being permitted for shorter periods of time, lower loads for longer periods—since it is well known that a transformer may be run at a high temperature for a short time without doing more damage to the insulation than would be done by lower temperature and a longer time. Furthermore, the relay is able to recognize the difference between a useful overload which it should hang onto and a short circuit which it will let go of almost instantly without waiting for the copper to attain a dangerous temperature. This relay also lights an indicating lamp in advance of any operation of the breaker, so that the power company may know that it has been subjected to a dangerous overload, thus affording an opportunity to change the transformer to a larger size without a service interruption at a critical period.

This arrangement also makes unnecessary the old-fashioned practice of making load checks on distribution transformers to determine if and when they are becoming overloaded. This information is provided automatically by the indicating lights on transformers equipped with the "TR" breaker.

The operating engineer doesn't require a slide rule in one pocket and a copy of the A.S.A. Standards in the other when the "TR" relay is used. Everything is done automatically. Advance warnings of excess load conditions are afforded him and in an extreme emergency which would have caused transformer burnout the unit is automatically disconnected before that takes place.

As to accuracy, the "TR" relay will operate within a range of ± 2 deg. in copper temperature under a given set of conditions and it will maintain this calibration year in and year out. The simplicity and low cost of the device are shown by its use in thousands of distribution transformers. Their reliability is proved by more than 250,000 in service to date on which almost no field trouble has been experienced.

For a more complete discussion of operation by copper temperature see the A.I.E.E. paper by Putman and Dann on this subject in the October, 1939, issue of *Electrical Engineering*.

H. W. PUTMAN,
Engineering Manager
Westinghouse Electric & Mfg. Co.
Sharon, Pa.

[Mr. Putman's attention was called to the fact that the editorial was addressed solely to the matter of power transformer temperatures. He further replied, in part, as follows—EDITORS]:

To the Editor of ELECTRICAL WORLD:

I have just signed off the test sheets on a 12,000-kva. power transformer equipped for "operation by copper temperature." We have also built some 60 "CSP" power transformers in the range from 1,000 to 2,500 kva. in addition to a number of unit substations similarly equipped and having transformers in the range up to 5,000 kva. Also for your information we are now actively negotiating a bank of 40,000 kva. units to be equipped for "operation by copper temperature."

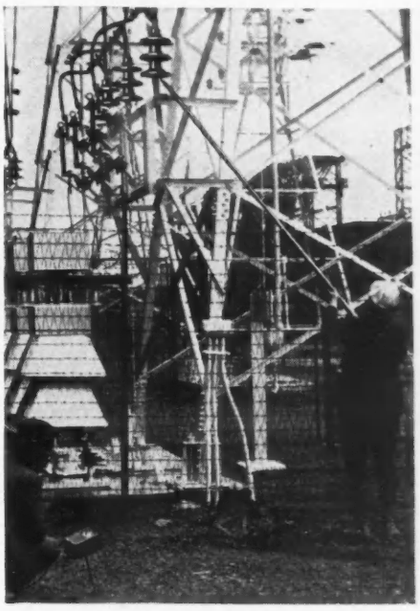
I know that some operating engineers have been hard to convince that a device which we use in distribution transformers by the thousands could be sufficiently precise and of adequate quality for use in power transformers. But this is actually the case. It is a far more accurate device than any of the old conventional hot-spot temperature-indicating arrangements.

H. W. PUTMAN

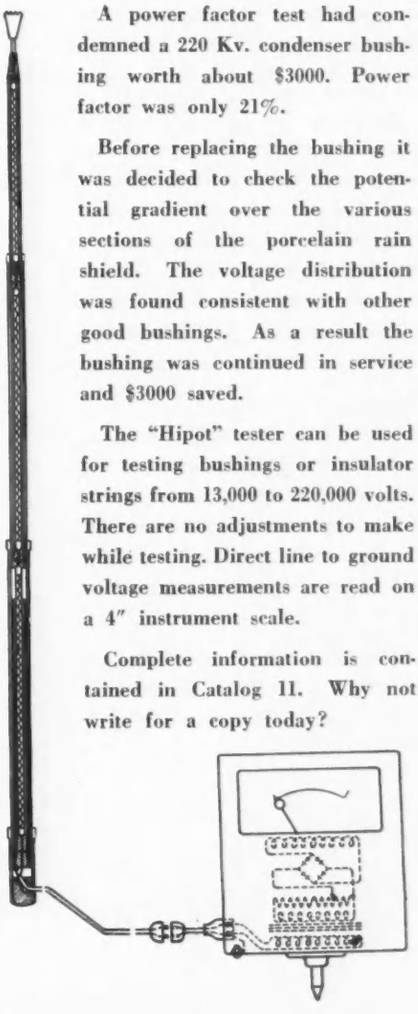
•

Bonneville Contract

Aluminum Company of America has applied for an additional 97,500 kw. of Bonneville power for expansion of its production at Vancouver, Wash.



$3000 Bushing Saved . . . by "Hipot" Testing



A power factor test had condemned a 220 Kv. condenser bushing worth about $3000. Power factor was only 21%.

Before replacing the bushing it was decided to check the potential gradient over the various sections of the porcelain rain shield. The voltage distribution was found consistent with other good bushings. As a result the bushing was continued in service and $3000 saved.

The "Hipot" tester can be used for testing bushings or insulator strings from 13,000 to 220,000 volts. There are no adjustments to make while testing. Direct line to ground voltage measurements are read on a 4" instrument scale.

Complete information is contained in Catalog 11. Why not write for a copy today?

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ROLLER-SMITH COMPANY
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Box Numbers in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E.W.

NEW ADVERTISEMENTS received by 10 A. M. November 13th will appear in the November 16th issue subject to limitations of space available.

POSITION VACANT

(See also "Selling Opportunity Offered")

MAN with ten years' experience in electric power plant design and construction with emphasis on wiring design. Must have initiative and must be skilled in preparation of single line schematic and three line diagrams and coordinating them with conduit layout. Please furnish experience record and state salary desired. Location, Boston. P-818, Electrical World, 330 W. 42nd St., New York, N.Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 30 years' recognized standing and reputation carries on preliminary negotiations for positions of the calibre indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

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(See also "Selling Opportunities Wanted")

RELAY, METER AND SUBSTATION Engineer, supervisory. Experienced. Desires change in employment. Operation or construction. Good references. Experienced in modern metering, relay coordination, layout of controls; installation, test and maintenance of equipment in substations and power stations. PW-804, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ELECTRICAL UTILITY EXECUTIVE. With fifteen years experience in Public Relations and Management of Municipal and Private, water and electric Utilities. Successful in competitive utility operation and load building. College education. Best of references as to ability, character and integrity. PW-814, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ACCOUNTANT and Auditor—Ten years electric utility experience in Credits, Merchandising, General Ledger and Construction Cost Records. Now employed as Accountant and Auditor, electric utility company, in charge of Accounting Department and Offie Manager. Extensive experience in finance and in preparation of Operating and Financial statements. Want responsible position with progressive utility company. Age 37. PW-819, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

DISTRIBUTION ENGINEER—B.S. in E.E. 15 years experience overhead and underground distribution. Very capable. Excellent recommendations. Employed by small company. Desires position with large company having opportunities for advancement. Age 40, married. Available upon short notice. PW-820, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

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ACCOUNTANT AUDITOR — thirteen years utility experience, traveling and executive accounting. PW-822, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

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For best established sales-representative for Government work and surrounding territory of Washington, D. C. Write Riddell, 300 B-st., S.E.

AN ELECTRICAL ENGINEER covering New England desires an agency for Electrical Apparatus to be used in construction. AW-815, Electrical World, 330 W. 42nd St., New York, N. Y.

Party would like for New England the Agency of a first class household electrical utensil or apparatus. AW-816, Electrical World, 330 W. 42nd St., New York, N. Y.

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